

HOTTEST OFF-ROADERS FOR '88

DOMINATOR

Radio Control

CAR ACTION

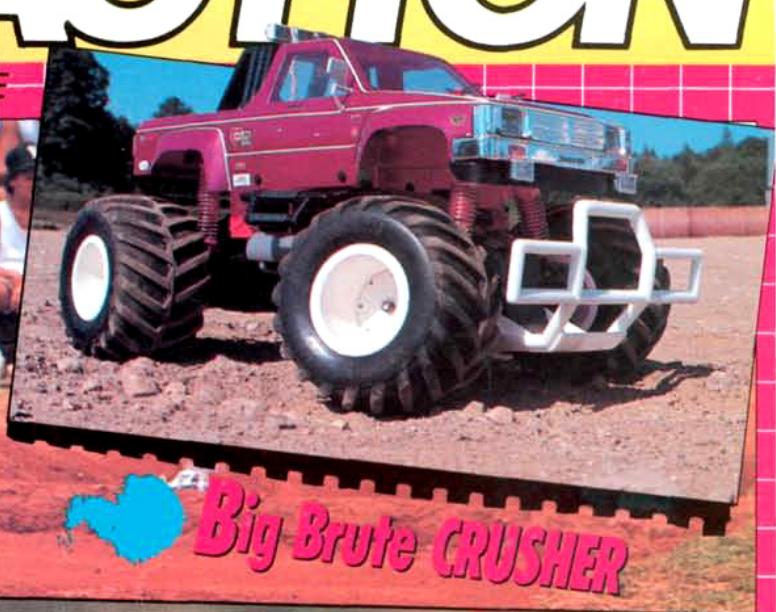
THE WORLD'S BIGGEST R/C CAR MAGAZINE

47380 December 1987 \$2.95

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2WD vs. 4WD



Big Brute CRUSHER



EXCLUSIVE:
Futaba FX10



AWESOME
Dominator

FOUR WHEEL DRIVE

SUPER-FAST
Tornado



12



Project Optima

Off-Road
Tire Guide

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Volume 2, Number 6
December 1987



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Cover: This month's cover features (very top) the new killer dirt-oval Dominator; top, Kyosho's Big Brute Crusher; middle, the versatile Mugan Manx; and bottom, a super-tricked-out Optima. All photos by Louis V. DeFrancesco Jr.

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Radio Control CAR ACTION

Publisher/Editor in Chief

LOUIS V. DeFRANCESCO, JR.

Associate Publishers

DR. LOUIS V. DeFRANCESCO

YVONNE M. MICIK

Editor

CHRIS CHIANELLI

Managing Editor

RICK NACCA

Editorial Assistant

TODD NEUHAUS

Technical Editor

CHARLES KENNEY

Associate Editors

RICHARD URAVITCH

RICH HEMSTREET

STEVE POND

West Coast Editor

MIKE LEE

Art Direction & Design

ALAN J. PALERMO

Art Assistants

MARTHA TUESCHER

MARY LOU RAMOS

Airbrush Artist

GARRETT MILLER

Advertising Director

FREDERICK J. MURPHY

Advertising/Production Manager

CHRISTINA FURORE

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EDITORIAL

by LOUIS V. DeFRANCESCO JR.

IT'S NO SECRET that 1/10-scale off-road cars comprise the largest segment of this great radio-control hobby, so we decided to dedicate a substantial part of this issue to these dirt-burners, and we're sure you'll love it. We, of course, have our usual off-road track reports, including the new and versatile Mugen Manx, a super-modified Optima, and a myriad of others, but there's more!

We've got the hottest contenders for '88 in both 2- and 4-wheel drive, a just-in report on the off-road nationals held in Atlanta, an off-road tire buyer's guide, some tips on electric motors and much more.

Our latest piece of car test equipment is a radar gun. We decided to start checking those harrowing top-speed claims made by many of the manufacturers. The radar gun has difficulty picking up the 1/10-scale electric cars but has no problem with the larger gas cars. We were amazed at the speeds the larger scale gas cars can reach. A case in point is the new 1/8-scale Tornado reviewed in this issue. With a just-broken-in O.S. .21 engine and a 25% mix of nitromethane, the car (and this is a 4WD machine)

consistently hit 45 mph on pavement! It doesn't take much imagination to see the danger potential so it's imperative that you exercise caution when running 1/8- and 1/4-scale cars. We will start featuring top-speed data on most cars we review in the near future.

And speaking of the future, we were able to get some late-breaking information on a new car introduced by Futaba—a name that is synonymous with radio-control transmitters and has been for years. The car is called the FX 10, and you can read about it this issue. I was recently asked by a journalist from a large newspaper what I thought was the most compelling event that took place in the R/C industry this year and I could have given him many answers. After much deliberation I surmised it was the Kyosho Ultima winning the 1987 World Championships. After being dominated for years by the Associated RC10 there is a new champion in the winner's circle. But what a testament to the design integrity of the RC10 that it could dominate racing for such a duration.

Yes, 1988 promises to be a very interesting year... ■



Editor, actress Barbara Kent and Louis DeFrancesco.

Louis



The Inside Scoop

by CHRIS CHIANELLI

THE R/C car industry is in a fast-pace state of advancement with new products being offered at a head-spinning rate. The number of choices from entry level to all-out competition equipment is ever-increasing. In light of this phenomenon, I'll make the manufacturers nervous and you R/C squirrels who are hungry for info happy by bringing you a special report on security leaks and "late-in" items in the new "Inside Scoop."



A NEW LOOK. I've heard once in awhile from $\frac{1}{12}$ -scale Porsche 959 owners that "I've got nothing to race against." Well, Tamiya has a new body to fit the same chassis as the 959—it's a Toyota rally body. Tamiya has also seen fit to give $\frac{1}{24}$ -scale Tam-Tech owners a few options, too. These will come in the form of a Porsche 961 and a Testarosa. The preceding info was supplied to us from an owner (spy) in the Orient, code named, "Lingafoon." The question is, will we see these products in the U.S.?

CMW's NEW 3D, a name that's been popping up in the winner's circle more and more (for their successful new speed controller) will be introducing their new 3D $\frac{1}{10}$ -scale electric car. Features will include 3 differentials (front, rear and central), 18 ball-bearings, FRP composite chassis and shaft drive. Projected weight of the car is about 2.8 pounds.

Also new from CMW is a belt-drive conversion kit for the Optima, a one-way front gear box (18- or 19-tooth), and the Optima/Hotshot one-way front drive shaft. These are two-piece one-way rollers made from carbon steel. Fits Optima, Supershot, Boomerang and Big Wig.

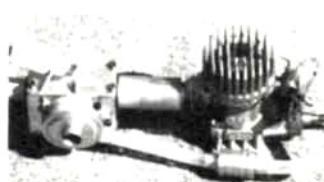
* * *

BUSY BOYS AT BOLINK. Seems the guys from BoLink have many irons in the fire: a new $\frac{1}{12}$ hi-tech road car, the Eliminator; a sprint car conversion kit for the RC10; and three new $\frac{1}{24}$ -scale NASCAR bodies—Thunder-

bird, Monte Carlo and Pontiac.

* * *

JUST IN. Trinity will be offering what they claim to be an exact copy of the motor Joel Johnson used to capture the World Champion title. The Silver Dot Signature motor was designed specifically for two-wheel-drive off-road cars.



IL TURBO AVANZA from the land of Testarosa: from this photo it looks as if those speed-hungry Italians have developed a turbo-charger that works off exhaust pressure (pictured here on this Picco 3.5). Leave it to the minds that brought us that space shuttle on wheels, the Countach. Facts will be yours as soon as they're ours.

* * *

FFLASH! Ultima cleans up. Romsey, England—In its first international event, the Kyosho Ultima swept the IFMAR $\frac{1}{10}$ -scale World Championships for two-wheel-drive cars on August 5 by taking first, second, and third places. Looks like there's a new boy on the block of champions.



MID-ENGINE OPTIMA: Joel Johnson took second place at the ROAR Nats in Atlanta. Sources say his car has belt-drive and ball differentials at both ends. A production car will be offered in the near future.



ORLANDO, FL: A night at the drags. Ken Hively of 8028 Rhea Circle, Orlando, Florida, gets the jump on the competition at the local track. This run was a 2.8 E.T. @ 47 mph ($\frac{1}{10}$ -scale, $\frac{1}{4}$ mile, 132 feet). The track record is 2.31 E.T. @ 56.5 mph. One-tenth-scale drag racing is sweeping the country, and we'll be doing a special issue on all forms of R/C drag racing; so watch for it!

Keeping the industry BUGGED, see you next mission....

CC

Race Strategy

by DICK BRINTON

The clean machine...a major part of winning!

IF YOU'VE READ the articles on "Handling, What It Is And How To Get It," and your car has been correctly set-up and adjusted.... If you've absorbed "Race Strategy I, II, III, and IV" and have practiced the driving skills and strategies outlined.... And if you're still not winning—or not winning enough—there are a couple of things to check. No, it's not that super motor or the latest whiz-bang all the pros are using. It's a lot closer to home than that. The problem may be the way you prepare your car and yourself for race day.

First let's take a look at the car preparation. Begin by cleaning the car *completely*. Personally, I don't like the idea of hosing it off under a faucet. Many of the moving parts (including bearings and axles) will rust, and water can kill your radio in a hurry.

You can remove the wheels and wash them, but clean the rest of the car with a brush. I use a so-called "acid brush," a cheap (20-cent), little metal-handled throwaway you can buy in any hardware store. As you brush the dirt loose, blow it off.



Water-proofing may seem more of a procedure for a boat, but as can be seen from this picture it has its place in R/C race cars as well.

Now inspect the car carefully starting at the front. Is the steering play within reasonable limits? Does it provide the same turning, left and right? Is the linkage



The off-road environment requires a constant battle of maintenance cleaning and troubleshooting. Sand, dirt or anything else of a powdery nature is a threat to your car.

damaged or bent? Compress and extend the suspension. Does the steering bind in any position? Turn your radio on and steer from limit to limit. Does the servo sound okay? Does it move smoothly from side to side? Sometimes what you think is a glitch is a missing tooth off a servo gear.

Do both front shocks (damper/spring units) feel the same? Are they leaking? If so, take them apart, fix them, and refill. Re-install and check the movement of the suspension for binds or interference.

With a clean rag or paper towel, wipe the front bearings and axles clean. If the bearings are sealed, they don't require lubrication. If they are sleeves, lube them as suggested in your car's manual. Then re-install the wheels on your car. Spin them. Are the tires tracking true? If they're not within reasonable limits, fix them. How's the tread? If your car isn't handling correctly, it may be time to change the tires. See the tire test article in this issue.

When you install the wheels, use large flat washers whenever possible; they really help keep dirt out of your bearings.

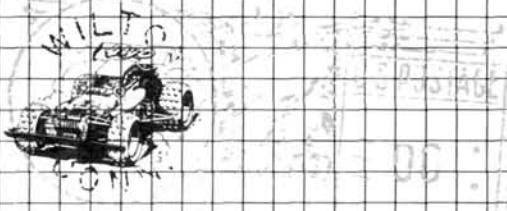
We'll be entering the muddy season soon and all it takes is a small sandwich baggy, some tape, and a couple of minutes to design your own suspension-protection system. Yeah, I got a lot of laughs when I first showed up at the track with the "baggy" car, but I never had a D.N.F. all season, and my car handled the same at the end of the day as at the start. It also

(Continued on page 70)



Here, a part of a plastic sandwich bag keeps the mud and dirt out, yet allows the suspension to work.

Letters



More Speedway Racing

I like your magazine on R/C cars; it is a very good magazine. I would like to see more R/C speedway racing in the magazine, though. Also, I am starting up a R/C speedway club in Canberra. The cars we will be racing are $\frac{1}{10}$ - and $\frac{1}{12}$ -scale sprint cars, super sedans, and grand nationals. I have sent you some photos of the cars we have in Canberra and I hope you like them. Can you please print my letter in *Radio Control Car Action* because I would like to hear from the clubs in America.

MARTIN FLEMING
Australia

Martin, it seems like oval-track racing in all its forms is sweeping the globe. Watch for the stock car special that will be in our first issue of '88. CC

True Colors Coming

While reading your great magazine I've noticed some of the cars have *Radio Control Car Action* decals and I would like to get some for my car—can you tell me how to get some? I would also like to know what color you painted the 2WD Coyote in the October issue; that's the color I want to paint my car.

KURT RINGHOFER

*Kurt, glad you enjoy *Radio Control Car Action*. Your request for decals is one that we receive frequently, and we're really flattered that a lot of you want to "wear our colors"! We've done something about it and will make them available sometime in the near future at a nominal charge. The color of the 2WD Coyote was achieved by first spraying (from the inside) Testor's Lime Metalflake followed by a full cover-coat of flat black.... Easy enough, huh?* CC

Sprint Car Shock-Adds

Yours is the best magazine of all R/C. If someone wants to know about any certain R/C car, you guys get it sooner or later in the magazine. I have a BoLink Round Tracker II Sprint Car and all it has for suspension is a flexy chassis. How can I mount a pair of shocks on it, and if so what kind? Keep up the good work!

PETER WENDT III
Greenfield, WI

Peter, check back with BoLink. Our sources inform us that they have just introduced a new 4-wheel suspension system for their car. We will let you know when we get more info. LVD

Tracking a Site

When I first saw your magazine it was like striking oil compared with the other ones. I was one of the first people in my town to get an R/C car. There is only one track in the area. I wrote to R.O.A.R and everyone else you can think of and asked where we should start building a track. But as suspected there was no reply, you are our last hope!

MAX LAWRENCE
Bristol, VT

Max, I hope that by printing this letter others in neighboring towns will contact you. CC

Leaning Sprinters

I've been reading your magazine for almost a year, and I think it's terrific. I am writing to you about a misprint or mistake in the October 1987 issue. On pages 20-21, in the article about "Quarter Pounders," how come the Pacesetter Hi-Tech Sprinter has two different rear tires?

RICK PERKINS
Concord, OH

There was no mistake. Sprint cars run on oval tracks and as a result only make left turns. Because of this they run what is called tire-biasing. If you look closely at the front tire on some of the other cars in the same article, you'll notice larger tires in the right side. Many cars that run on oval tracks use larger tires on the right side to help in the left turn. CC

Upcoming: Putting Them on The Road

First of all, you've got the best R/C magazine! My friends and I have enjoyed your "Letters" section so much that we had to write in. I'm 16 years old and have a Hornet. The only access to a running place is a paved dead-end in our neighborhood. I'm trying to convert my Hornet into a on-road pick-up truck, loaded with head, tail and stop lights. Are you going to do anything on how to make $\frac{1}{10}$ -off-rovers into $\frac{1}{10}$ -road-cars? Keep up the hip magazine!

P. SAWCZYN
Knoxville, TN

I have to compliment your staff. I always read each issue of the mag three or four times. Keep up the good work. I'd like to know if there are any sprint car conversion kits for other cars or just the RC-10?

J. BRARHAM

Dear Hornet Lovers, in coming issues we'll be featuring a few different types of Hornet modifications, including a sprint car and on-road conversions for you guys in Hornet heaven. CC

R.O.A.R. Rebuttal

In response to "Big" Jim Greenmeyer's letter in the October issue: he sure has caught me red-handed. It's all there in his "R.O.A.R. has been a thorn in my side" letter. All about how I've been behind the scenes slippin' sleeping pills

GET SIDEWAYS!

With the Moody "AMERICAN" 1/8th Gas Sprint Car.

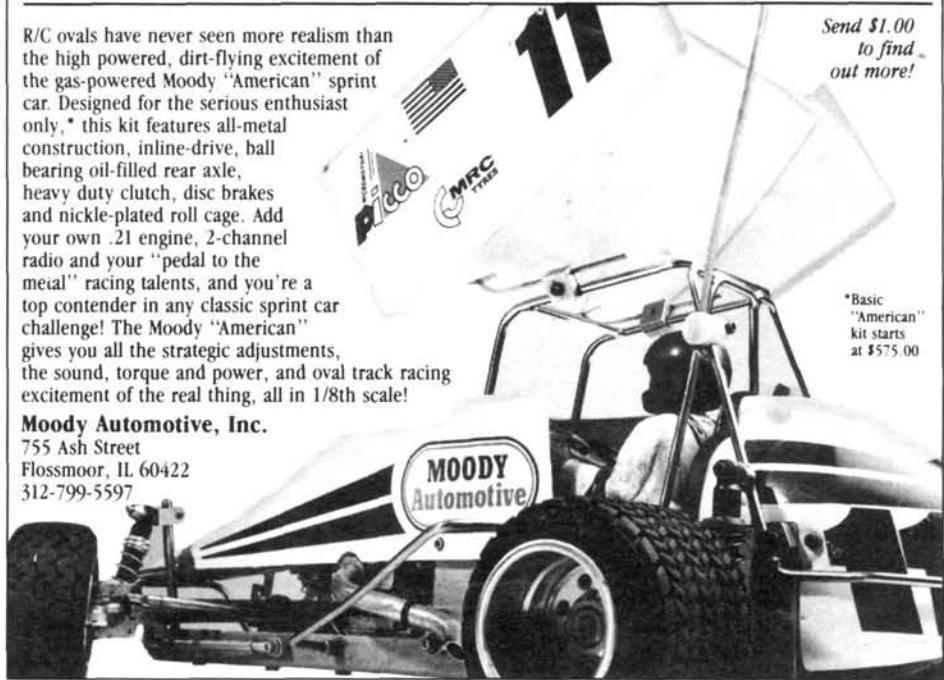
R/C ovals have never seen more realism than the high powered, dirt-flying excitement of the gas-powered Moody "American" sprint car. Designed for the serious enthusiast only,* this kit features all-metal construction, inline-drive, ball bearing oil-filled rear axle, heavy duty clutch, disc brakes and nickel-plated roll cage. Add your own .21 engine, 2-channel radio and your "pedal to the metal" racing talents, and you're a top contender in any classic sprint car challenge! The Moody "American" gives you all the strategic adjustments, the sound, torque and power, and oval track racing excitement of the real thing, all in 1/8th scale!

Moody Automotive, Inc.

755 Ash Street
Flossmoor, IL 60422
312-799-5597

Send \$1.00
to find
out more!

*Basic
"American"
kit starts
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to the R.O.A.R. officials so they'd snooze over 5-minute racing. Of course folks might wonder about those articles I wrote in *R/C Model Cars* and *R/C News*, back in March and May 1986, proposing a 5-minute 1/12-scale class and presenting a complete set of rules. A lot of people might figure that I favored 5-minute racing after writing those articles, but not "Big" Greenmeyer. Then there was the World Championships in Las Vegas, where Ken Campbell (Delta Systems) and I set up a 5-minute demonstration race. We didn't fool Mr. Greenmeyer there either, not one bit. He knows it was all just a cover-up, pretending to promote 5-minute racing, while we secretly corrupted R.O.A.R. officials. I'm really going to be in trouble when "Big" Greenmeyer finds out that I wrote the proposal R.O.A.R. presented to IFMAR to shorten 1/10-scale World Championship races from five minutes to four. He'll probably figure out that I'm putting the big snooze on IFMAR officials too!

ROGER CURTIS
President, Associated Electrics, Inc.

From the Staff:

In the "Vaporizer" article featured in the October '87 issue of *RCCA*, there was mention made of using an electric fuel pump to transfer fuel to the car's tank. Because of the explosive properties of gasoline, there are few fuel pumps considered safe for this use. If you wish to use an electric fuel pump, we recommend that you use a pump with a brushless motor, the type motor specifically made for use with gasoline. However, for safety's sake, we recommend using a manual fuel pump instead.

We welcome your comments, and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length. We regret that due to the tremendous amount of letters we receive we cannot respond to every one.

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MOTOR MAGIC

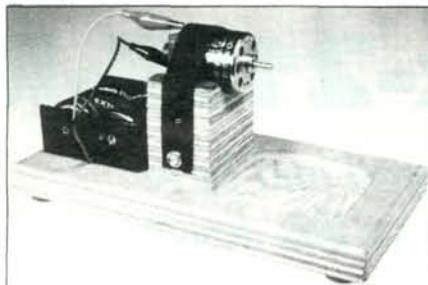
Part I

Run like the pros by keeping your motor at peak output.

by TOM AUMENT

HERE HAVE BEEN some questions recently about "motor magic" and about how the pros run so consistently. I'd like to explain this and talk about how you can keep your racing motor working at 100%.

With the advent of the convenient spray cleaners, a lot of racers are forgetting to clean their motors. I've talked to several racers who think that the spray cleaners do it all: this is a misconception. The ever-popular spray cleaners only do part of the cleaning job.



Motor is being broken in with two D-dry cell batteries on SRT motor stand, a most important step for maximum efficiency.

The reason why the spray cleaners only do a partial cleaning is quite simple. The dirt which our cars run on has ionized particles that cling to the magnets. These particles hamper the armature from turning freely.

The process of cleaning off these damaging particles is a bit time-consuming, but well worth the effort.

First, I recommend that you buy a good motor cleaner (such as BoLink* Electro-Whirl). Fill a small jar (one that you can easily immerse your entire motor in) with the cleaner. Now, connect the motor to a



A matched set of record-breaking Black Magic motors wound by the venerable Tom Aument.

power source (I use a battery charger set at 2 amps). While the motor is running, dip it in the cleaner. Hold onto it and turn the charger up to 4 amps and count to five. With the motor still running, pull it out of the jar and again count to five, shaking off the excess cleaner. Now, some good spray cleaner (such as Reedy in a Can*) comes into use. With the motor still running, grab your commutator and give it a little shot. Finally, turn your motor off and put a drop of oil on each bearing.

Now, you'll really have a *clean* motor. Go ahead and take a look in the jar. Surprised? What's in the jar is the reason why the pros clean their motors this way; and they clean 'em between each and every heat.

I'd also like to say a few words about the proper break-in of your new motor or second set of brushes. This is very important in order to get full running potential.

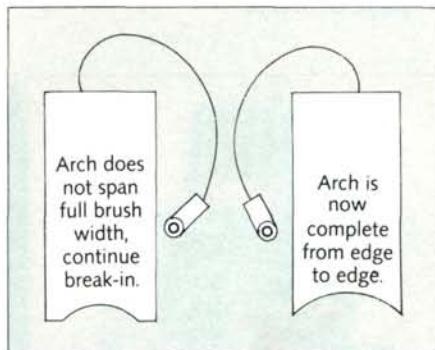
Start by getting four D-cell flashlight batteries and hooking two of them up to make 3 volts. Tape your motor wires on

the batteries. Let the motor run until it stops running (about 2 to 3 hours). Be sure to check and see how hot the motor is while you're breaking it in. Use a fan to keep air blowing on it to prevent overheating. After the batteries have run down, pull out your brushes. There should be no flat spots on them.

After completing this procedure, your brushes should be fully arched. If not, repeat the above steps with the other set of batteries.

Brushes which are properly broken-in will supply you with at least 20% more horsepower. However, improperly broken-in brushes can cause arcing, which can create problems of excess heat and radio interference.

Break-in those brushes properly and eliminate some racing headaches.



Above diagram shows the before (left) and after (right). Note right-hand diagram shows commutator brush fully broken in.

*The following are the addresses of the companies mentioned in this column:

BoLink R/C Cars, 420 Hosea Rd., Lawrenceville, GA 30245.

Associated Electric, 3585 Cadillac Ave., Costa Mesa, CA 92626.

Engine Review

by PETER CHINN

SPECIFICATIONS

Type: Air-cooled, single-cylinder, side-exhaust, two-stroke cycle, with crank-shaft rotary-valve and Schnuerle scavenging.

Bore: 16.6 mm (0.6535 in.)

Stroke: 16.0 mm (0.6299 in.)

Displacement: 3.463cc (0.2113 cu in.)

Nominal Compression Ratio (full stroke): 12:1

Speed Control: O.S. Type 2S slide-throttle adjustable automatic mixture control carburetor.

Checked Weight: 289 grams (10.2 oz)

Mounting Dimensions:

Crankcase width: 29.2 mm

Length from driver face: 74 mm

Height above CL: 72 mm

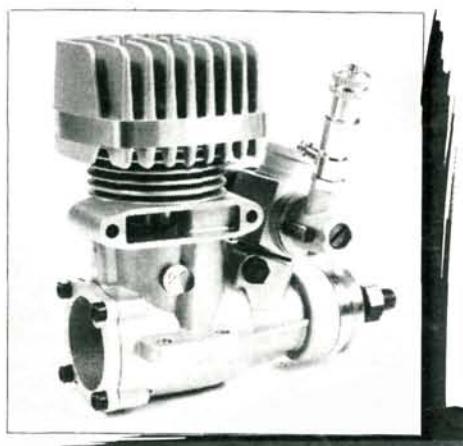
Bolt hole spacing: 38x15 mm

Manufacturer's Claimed Power Output: 1.5 bhp at 29,500 rpm

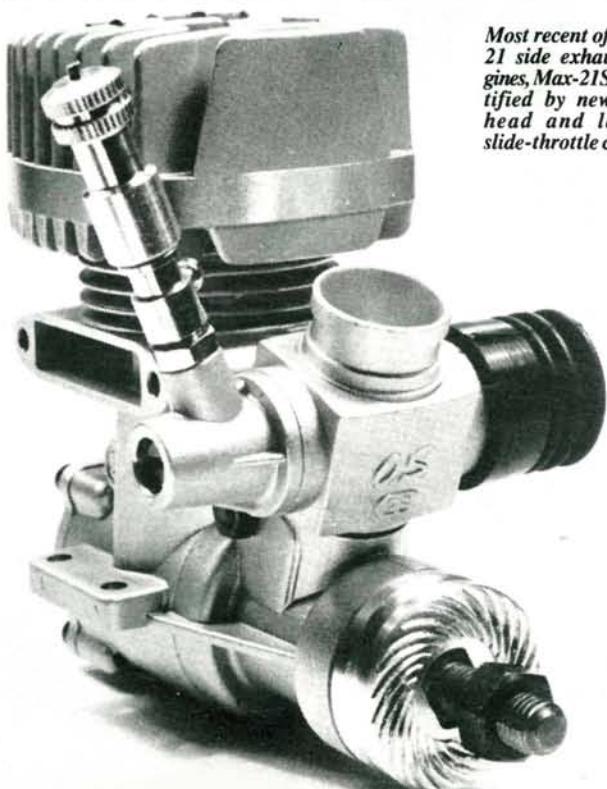
Manufacturer: O.S. Engine Mfg. Co. Ltd.,

Higashisumiyoshi-ku, Osaka 546, Japan.

U.S. Distributor: Great Planes Model Distributors Company, P.O. Box 4021, Champaign, IL 61820.



Visible in this photo is rearward bias of port in exhaust stack. Note, also, mixture control screw in center of carb body below needle-valve.



Most recent of O.S. Max-21 side exhaust car engines, Max-21SE-R is identified by new cylinder-head and large-bore slide-throttle carburetor.

O.S. Max-21SE-R

New cylinder head and large bore carb improve this design.

THE TWO top-rated engines in the current eight-model O.S. car engine range are the Max-21VF-R and the Max-21SE-R. The 21VF-R is a new version of the previous 21VF-R that was dealt with in the very first issue of *Radio Control Car Action* (Winter 1985-86) and which had just made its debut by placing second in the World Championships. The Max-21SE-R, dealt with here, supersedes the Max-21SF-R and its predecessor, the Max-21FSR-R. (This proliferation of suffix letters may be a bit confusing but there has been a lot of development in O.S. car engines during the past few years.)

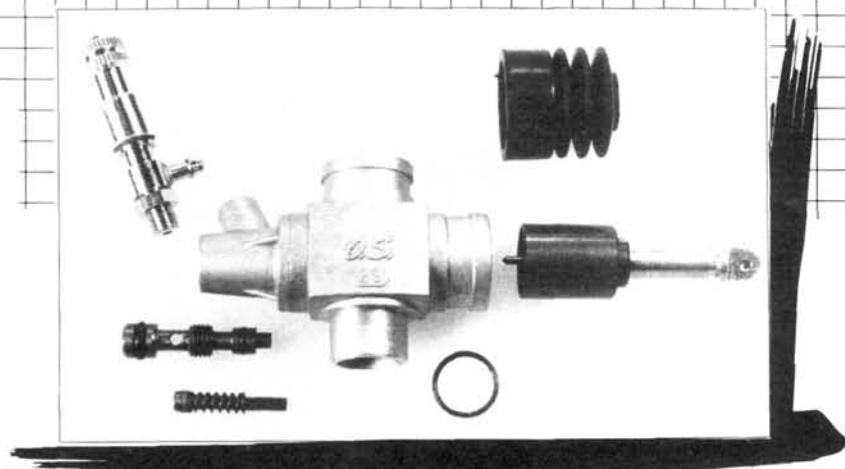
The Max-21VF-R is a rear exhaust engine, whereas the Max-21SE-R is intended for those installations where a side exhaust is more appropriate. Like the 21VF-R, the 21SE-R has an O.S. slide-throttle carburetor and both engines have a similar high level of performance, each being nominally rated at 1.5 brake horsepower at some 29,500 rpm.

Unlike the VF series engines, the 21SE type has a one-piece body casting. That is to say, instead of having a detachable front end to carry the crankshaft bearings, the housing, like the cylinder casing, is an integral part of the crankcase. The basic design of the main casting, in fact, is the same as has been used for several years

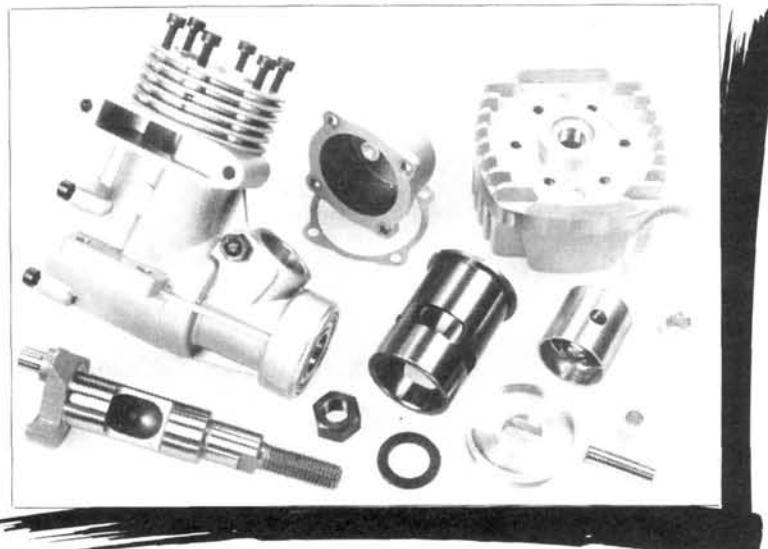
— by all O.S. Schnuerle-scavenged, side-exhaust .21, .25 and .28 cu in. engines. In this, the cylinder sleeve or liner is rotated in the casing to bring the exhaust port to the right rear quarter; the two main (Schnuerle) inlet ports to the front-right and rear-left locations, and the third inlet port, front left. This, obviously, has required the three bypass channels in the surrounding casting to be relocated to align with the ports in the cylinder sleeve. The exhaust stack is also suitably contoured internally to conduct spent gases smoothly from the rearwardly angled port. The advantage of this arrangement is that it provides a continuous cylinder wall surface, uninterrupted by ports, for the Teflon end-pads of the full-floating wristpin. Actual ports consist of a deep unbridged exhaust port (timed to remain open for a lengthy 168° of crank angle) flanked by angled and slightly inclined Schnuerle ports (124°) and a single steeply inclined third port (122°) diametrically opposite the exhaust.

In common with other racing type O.S. two-cycle engines, the Max-21SE-R is of the "ABC" type, using the O.S. factory's special ultra-hard, low-friction, composite electroless plating over a brass liner. The brass core is not visible as, in contrast to other types of ABC construction, the plating covers all surfaces of the sleeve, rather than the bore only. The ringless piston is beautifully fitted to the convergent bore and, appropriately for such a high-speed unit, reciprocating mass is low, the piston weighing only 4.7 grams complete with its 4 mm o.d. tubular wristpin. Again, in recognition of the stresses imposed by the engine's high operating speed, the connecting-rod, machined from high-duty aluminum alloy, is of very sturdy proportions and is phosphor-bronze bushed at both ends, there being two oil-holes at the lower end. It is 29 mm (1.81 x stroke) between centers.

The crankshaft has a main journal diameter of 12 mm, a 9 mm o.d. front journal and a 5 mm o.d. hollow crankpin. The shaft is bored 8.7 mm for the gas passage and is gas-flowed where it meets the large rectangular valve port. The latter gives a very long induction period of some 215° of crank angle, timed 35° after bottom dead center to 70° after top



Parts of Type 2S carburetor. Needle-valve assembly, mixture control screw and throttle stop screw on left of carb body, throttle slide and rubber bellows on right.



Other parts of Max-21SE-R. Superior finish of all components of this powerful track-car engine is clearly evident in photo.

dead center. The shaft runs in high-quality ball journal bearings, an NSK shielded type at the front and, as now increasingly used for ultra high speed engines, a special one at the rear having a durable plastic type retainer.

A new pressure-cast cylinder-head, with deep, transverse, tapered section vertical cooling fins, is used, secured to the main casting with six 2.5 mm hexagon socket head cap screws. As is customary with O.S. engines when a cast aluminum head is employed, rather than one machined from bar stock, the glow-plug hole is equipped with a cast-in brass thread insert. The combustion chamber shape consists of a 10.5 mm diameter shallow central bowl, surrounded by a 3 mm wide sloped squishband. A recessed

0.2 mm soft aluminum gasket is used between the head and liner flange.

The Max-21SE-R has a 13 mm i.d. intake boss into which is inserted an O.S. Type 2S slide-throttle type carburetor, securely retained by a cotter pin and nut. The pressure-cast aluminum carburetor body has a 9 mm i.d. venturi throat which, after allowing for the jet assembly, provides a large effective choke area of some 54 sq mm at full throttle. This obviously contributes in no small measure to the engine's high peaking speed of nearly 30,000 rpm. Needless to say, a pressurized fuel feed is required with this carburetor. The sliding throttle barrel is of aluminum alloy with a hard-coated surface and carries a fixed needle which enters the jet

(Continued on page 152)

THE KYOSHO

W

HEN KYOSHO* introduced the Ultima, they predicted they'd win the 1987 two-wheel-drive world championship. I reviewed the Ultima in the April '87 issue of RCCA. At that time I stated that the car had the potential to beat the world. I also said the main ingredient Kyosho needed was a world-class driver.

That's where Kevin Kelsey of Great Planes Model Distributors entered the picture. Besides his regular corporate duties, Kelsey is also the Kyosho U.S. Team Coordinator. In March he started bringing together a group of off-road drivers to form the Kyosho U.S. Team.

Three weeks before the ROAR off-road nationals, Kelsey recruited the most-popular driver in radio-control racing. Joel Johnson of Team Trinity was brought on-board to drive the Ultima and the Optima. While still racing under the Team Trinity banner, he's an unofficial Team Kyosho driver. Kelsey figured that with Johnson's $\frac{1}{2}$ -scale record, "He had to be an excellent driver."

Johnson has only driven in two off-road races for the Kyosho team, the ROAR nationals, and the IFMAR off-road world championships. At the nationals in the two-wheel open, he qualified his Ultima with second fastest. In four-wheel open, he drove an Optima prototype to a second-place finish.

Kelsey says, "Joel has exceeded all my expectations. He's built his own cars and done all his own suspension work at the worlds." Johnson's Ultima qualified third fastest at the worlds in England, and went on to win the two-wheel-drive championship.

Team Kyosho Ultimas swept first, second, and



From left: Katsunori Kondo, Joel Johnson, and Kris Moore.

third places in the championship main. Johnson's Ultima used a Trinity* graphite chassis pan (part No. 8028) and Trinity shock towers (front, No. 8025 and rear, No. 8026). The second-and third-place finishers used the Option House* special chassis (No. UM-27). All three cars used new prototype adjustable ball differentials.

Ultima makes good on its claim, "Next world champs."



Ultima...the new kid on the block of world champs.

These should be available to the public early in 1988.

Johnson's Ultima was Trinity-powered, while the second-place finisher used a Twister motor.

Kyosho's Team was not only set up for racing but they're also involved in research and development. The team drivers were running prototype, mid-engined Optimas. The drivers only received these new cars four days before the Nationals, so you can see how Kyosho cars are developed through competition. And yet, after only three weeks with the cars, the Kyosho Team drivers took five of the top-ten qualifying spots at the world championship in the four-

(Continued on page 38)

Track Report

Lyosho.

BIG BRUTE RULES

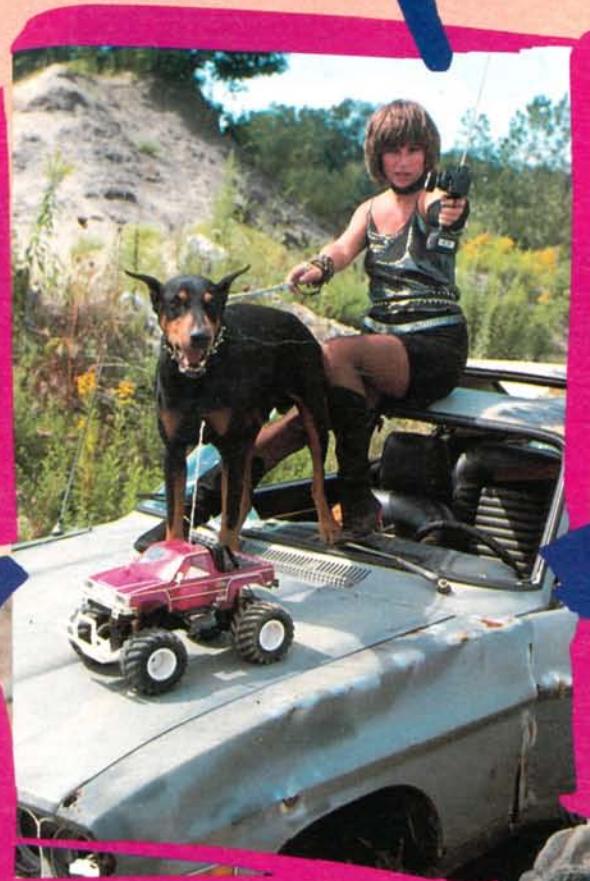
THE WASTELAND!



by CHRIS
CHIANELLI

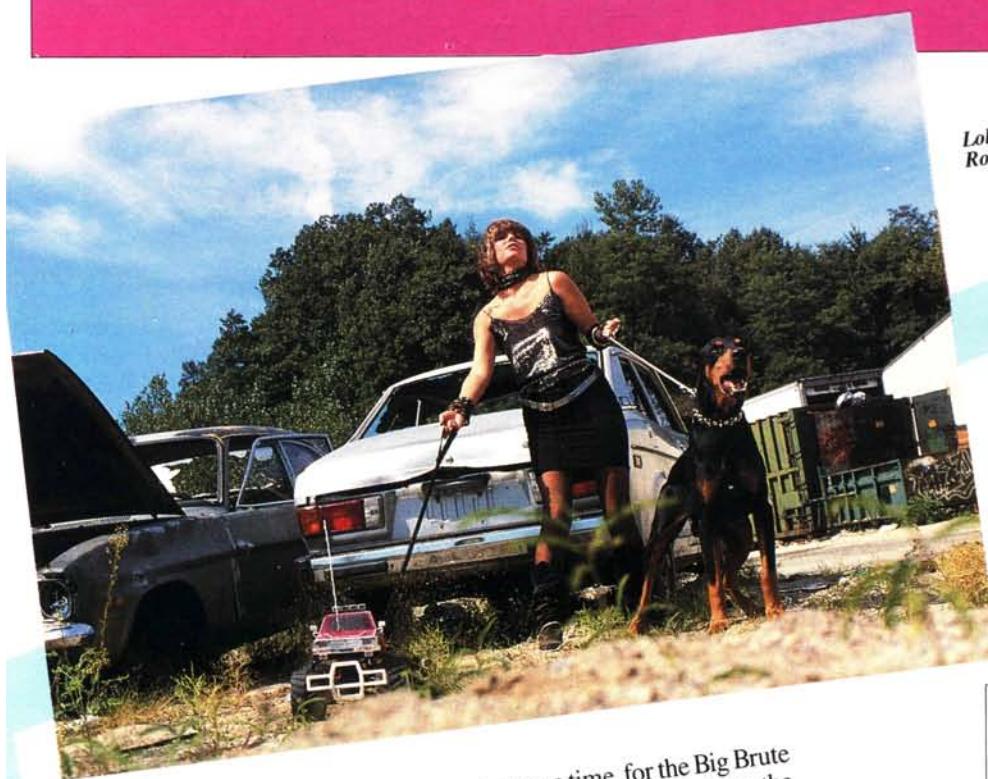
AIR NYMPHS of the wasteland fall easy prey to the vicious marauding tribes of the outland, lest they be guarded by their loyal champions. Lola, the Queen of Rock and Rolla, is never without her faithful dogs of war, Big Brute and Warlock. These two creatures were selectively bred with one purpose and only one purpose in mind—survival!

There are those who are clever enough to take a good design and adapt it to a variety of uses. This policy, if done by experienced engineers, will bring a proven design to do battle on widely diverse terrains; it also saves the manufacturer much of the cost of retooling. The other school of thought is, build the machine for its intended use from the start. That seems to be a



Master
Blaster!



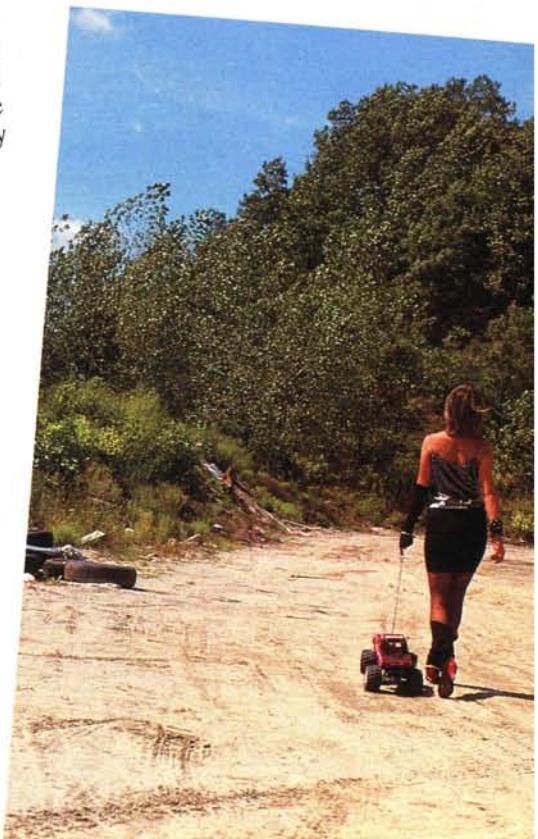


Lola, the Queen of Rock n' Roll, with her Dogs of War.

The new PDI Reverse Zeta waterproof speed controller is perfect for the Heavy Metal truck.



Chassis and suspension of the Brute was originally designed and conceived for truck application.



my friends and warriors of the badlands, was designed from the ground up as a truck, a Monster truck. This policy tends to make us wait for the end result while the necessary R&D is being done, but the wait is almost always a worth-while pay off in the form of a most functional design. Such is the case with the Big Brute.

The main frame of the Brute is a narrow bathtub-type that incorporates a top cover with an access window/hatch for inspection and adjustments. The advantages of this are quite obvious, it helps greatly in keeping the dust of the wasteland from getting in to foul up the internal vitals. Both the front and rear suspension components consist of very beefy lower A-arms and upper thick nylon links; both of these ride on steel shafts. Brass ball-joints hold the spindle carriers in place. The rear wheel spindle carriers use ball-joints as well to allow for toe-in adjustments at the rear. On my pre-production example a set of links were only provided at the rear of the spindle carrier. A set in the front of the spindles were needed to cut down on slop. All production Brutes will have these links at both front and rear stations. This may seem a bit of overkill, but let's not forget that the remains of some of the best have been found bleaching in the sun out on damnation alley.

At the front, the two steering links are connected to what has to be the hugest center rod I've ever laid my eyes on. It can be described as a nylon rendition of angle iron. All plastic parts, including the large front bumper, are high grade, not the type that strips threads when screws are taken out for maintenance or repairs. The aforementioned is proof that Kyosho has done much to make the Big Brute a survivor. That's not to say there's no room for improvement; there is, as always.

The stock shocks—although some of the best friction units I've come across, providing a true

(Continued on page 98)

Track Maintenance

by RICH HEMSTREET



Garden rakes are used to keep the top layer of dirt loose for good traction.



Larger stones are easily removed from track surface with rakes.



Watering a dirt track between heats will usually increase traction.



A small tractor pulling a drag rake is a good way to loosen the flat areas of your track. Plenty of weight works best in this process.

Take care of your track and get the most out of your racing.

OFF-ROAD tracks are relatively inexpensive to build. When you compare the costs of digging up an empty lot to laying concrete or asphalt, you can see why off-road racing is so popular. While it's easy to put in an off-road track, that's only half the battle. Maintaining the track is the other half. First, you'll need to locate the essentials: a water source, some good, sturdy garden rakes, a shovel, and perhaps a wheelbarrow. If you're maintaining a dirt oval track, you might also need a roller and a drag sled plus some way to pull these, such as a small garden tractor.

Every dirt track is different because of the mixture of soil types. In most cases, there will be some problems. Rocks and stones seem to sprout out of the track surface. While $\frac{1}{10}$ -scale off-road cars can bounce over a lot of small stones, it really doesn't make for good racing. Flip the rakes over so that the tines are up, and use the back of the rake to pull rocks off the track.

Most tracks will have better traction if they're watered periodically throughout the racing program. Some tracks need more water than others. Without it, tracks tend to become hard-packed and slippery. Never leave puddles of water standing on the track surface, though. Also, never spray water onto the track while cars are racing on it. Our radio systems and electronic speed controls can be shorted out and destroyed all too easily by water. Don't risk wrecking someone else's car.

The garden rakes should be used to loosen the top layer of the track surface. Try breaking up the top $\frac{1}{2}$ inch of dirt, and see what sort of traction you get. You have to experiment with all of these things to find out what works best for

your track. The back of the rakes can also be used to level rough spots on the track once the surface is loosened.

Larger holes in the track can be fixed with a shovelful of dirt. Shovels can also be used to tamp down soft spots. A wheelbarrow is helpful if you want to add any bumps or jumps.

Oval tracks should be very smooth because of the high speeds run on them. I was recently at a clay oval that was so smooth, $\frac{1}{10}$ -scale on-road cars with foam slicks were the fastest way around, yet it was definitely a dirt track. This track is watered with sprinklers for a couple of hours in the morning of the race. In the afternoon a garden tractor is run around the track to work the moisture in and smooth the track. At night the track is ready for racing without any work needed during the event.

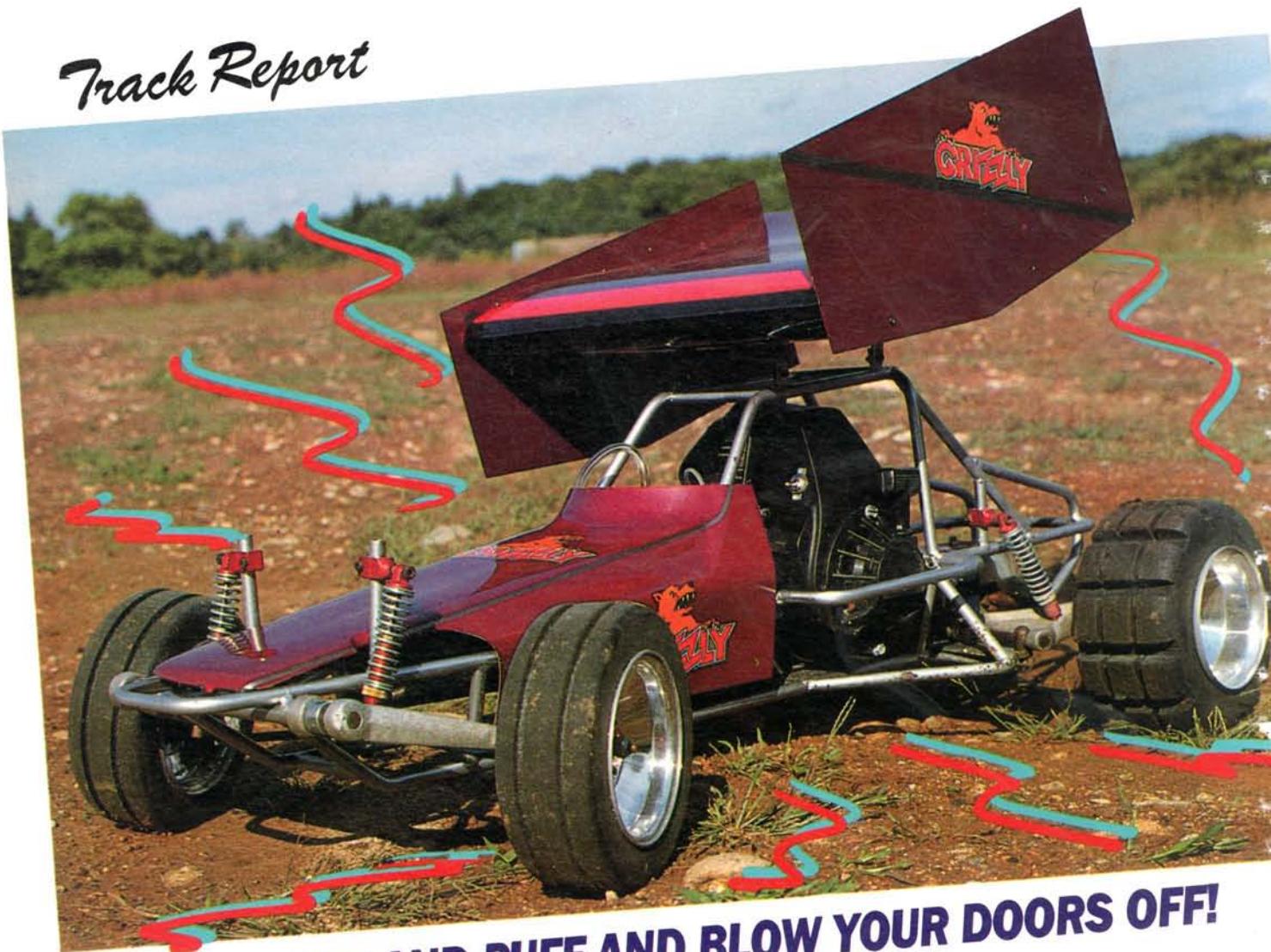


Off-road cars send dirt flying while racing; somebody has to put it back!

A roller works well to smooth out an oval track after the surface has been loosened. You don't want the roller to be so heavy that it leaves the dirt completely hard-packed when it's done. A drag does the work of the rakes, only better. It should have spikes in the bottom that will dig into the track at least $1\frac{1}{2}$ inches. Sometimes the depth of the drag's cut can be adjusted by the amount of the weight placed on top of the drag. In most cases, the drag will only be used occasionally. If possible, try to have the drag wider than the tread width of the tractor pulling it. This will help to make for a more consistent surface without tire marks.

Take care of your dirt track and it will last through many seasons. In fact, it will improve as you learn how to maintain it.

Track Report



IT'LL HUFF AND PUFF AND BLOW YOUR DOORS OFF!

PACESETTER

by STEVE POND

FOR SOME TIME now, I've been building a variety of 1/10-scale electric off-road cars. These cars serve as a great form of recreation, and it doesn't get much better than when you're lockin' wheels, bashin' around the track. The one exception, not to take anything away from 1/10-scale cars, is the awesome 1/4-scale car, and being an off-road buff, the 1/4-scale Grizzly from Pacesetter Products* is the cat's meow. The awesome presence of the Grizzly is enough to distract even the most dedicated 1/10-scaler.

THE KIT. The last time the Pacesetter Grizzly

GRIZZLY



The rear view of the Grizzly shows the heavy-duty half-shafts, dual-disc brake and enclosed rear end.



graced the pages of *RCCA* was in the Summer 1986 issue. At that time, the Grizzly featured a McCulluch chain-saw engine and a steel-and-aluminum frame. The new Grizzly, aside from obvious cosmetic changes, features a powerful 2.3-horsepower Quadra 2-stroke engine with recoil starter, and an aircraft-grade tubular steel frame and roll cage. The power is transmitted to the rear wheels via a centrifugal clutch that is connected to a jack-shaft with a roller chain.

On the other end of the shaft is another sprocket that is also graced with a roller chain from the rear end. The

rear end is fitted with dual inboard disk brakes that are activated with a cam lever connected to the back side of the throttle servo. The rear end is connected to the rear wheels with a set of dog bone-type half-shafts. The wheels (front and rear) are spun aluminum that are mounted by a set of dense foam tires.

To take up the bumps, there is four-wheel-independent suspension, of the trailing arm-type, damped by oil-filled coil-over shocks. This package is then topped off with a hand-laid fiberglass body. The options that are available for the Grizzly include a rear wing for oval racing, modified alcohol-burning engines, a header made by Jose of Hedman Headers, a 2-channel radio system with heavy-duty servos, high-volume air cleaner, and special racing oil formulated for use in two-stroke engines.

CONSTRUCTION. The assembly starts off with the rear end. After this is assembled, the brakes are attached, and the whole unit is attached to the chassis. This is followed by the rear suspension arms and shocks. Next the engine is connected to the chassis via solid mounts. The front trailing arms are then attached to the chassis along with the respective shocks and steering linkage.

The next step is the all-important radio installation. The cut-outs in the radio tray

are tailor-made to accommodate the monster Futaba S-34 high-torque servos. These servos sport a whopping 112.6 oz./in. torque and a

(Continued on page 146)



This view shows the Quadra Q35 engine, fuel tank, and Futaba radio gear.

7 Troubleshooting

Grasshopper Hop-Up Tips

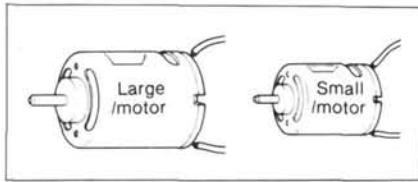
by FRED MURPHY

AS THIS column approaches its second anniversary, I'd like to thank all of you for the hundreds of letters I've received each issue. Your input lets everyone know what troubles our R/C readers are having, and gives me an opportunity to shed some light on the possible solutions. One of the most common questions comes from the thousands of MRC/Tamiya* Grasshopper owners, "What can I do to hop-up my Grasshopper?"

The Grasshopper, as many of us know, is the little brother of the Tamiya Hornet and is one of the most widely sold entry-level kit cars in the R/C industry. Let's first look at what will transform your Grasshopper into a Hornet.

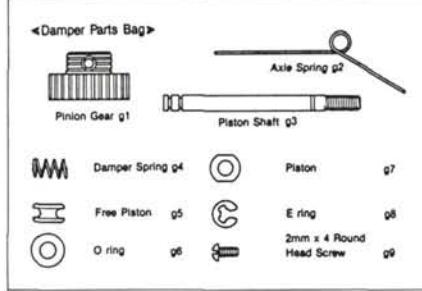
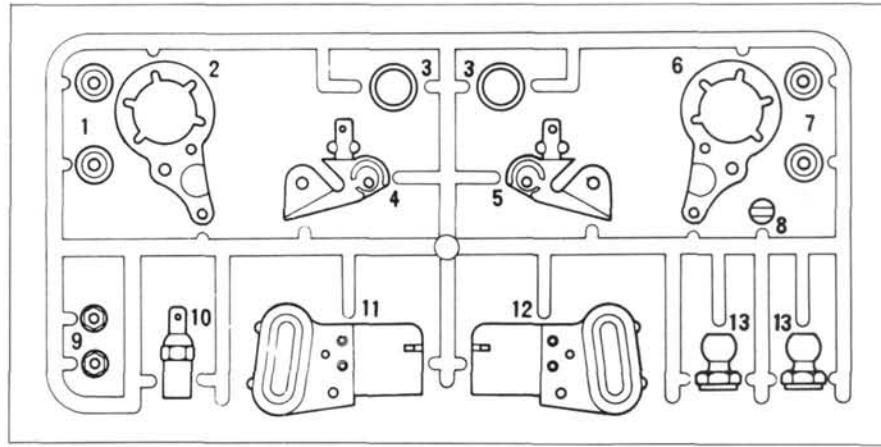
The major difference is the motor. The Grasshopper comes stock with a Mabuchi RS-380 motor and the Hornet comes with the RS-540. To bring the Grasshopper up to par in this area, you'll need the Mabuchi RS-540 and an 18-tooth pinion gear.

Remove the Grasshopper powerplant and mounting plate. This will allow direct bolting into place of the RS-540 with the



Mabuchi 540S on the left in comparison to the stock Grasshopper 380S motor.

new, larger pinion gear. Hook the color-coded wires in the same location as the RS-380 you just removed. When installation is complete, test to make sure the wheels turn in the proper direction. If they turn in reverse when you throttle forward, simply reverse the motor connection; this will reverse the polarity of the motor and

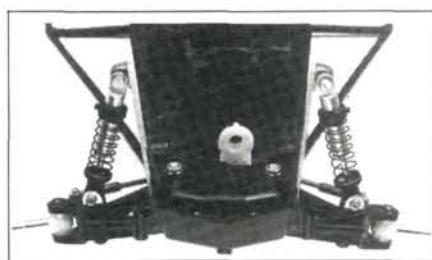


Parts card No. X-8812 above and parts bag No. X-8817 will enable you to make a Grasshopper-to-Hornet conversion.

its direction of turn. Keep in mind that the addition of the larger motor will mean shorter running times than the RS-380. You may be used to getting as much as 30 minutes running time out of the smaller powerplant; don't be surprised if that running time is cut in at least half on a fully-charged battery.

The next difference between the Grasshopper and Hornet is the rear suspension. The Hornet is equipped with oil-filled shocks; to add them to the Grasshopper, you'll need to change a few components. MRC/Tamiya part No. X-8812 allows you to make the necessary changes for the upgrade. From the parts card, use parts No. 2 and 6 (to mount the shocks to the axle), numbers 4 and 5 (to mount the shocks to the chassis), and numbers 11 and 12 (to upgrade the mount of the gear

box to the chassis). Along with the upgraded gear box mounts, you'll need a set of axle springs (which can be had by buying parts bag No. X-8817). This also includes the 18-tooth pinion gear which you'll need for the RS-540 motor. As far as shocks go, you can get the Tamiya



CRP front suspension kit will greatly improve handling.

dampened units for the Hornet, but in the "Project Grasshopper" article in the February issue of *Radio Control Car Action*, I had very good luck with

(Continued on page 38)

Track Report

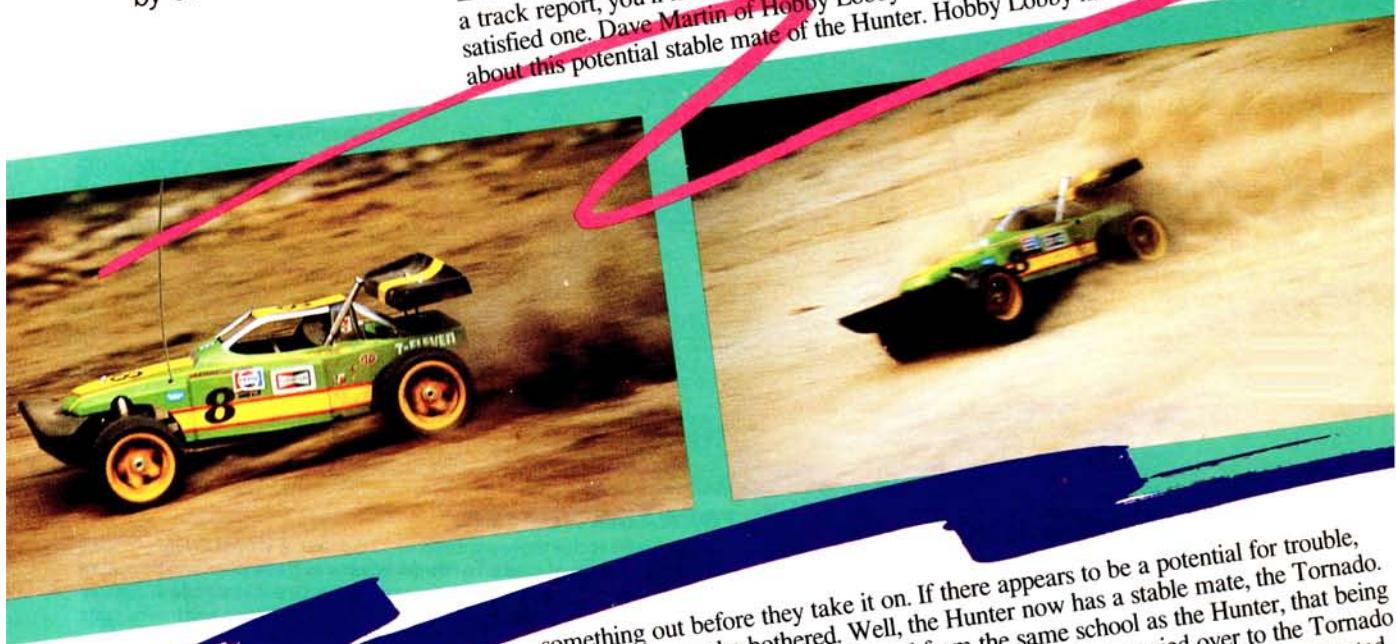
HOBBY LOBBY

WINDO

This whirlwind packs a nasty 40-mph nitro punch.

by CHRIS CHIANELLI

BACK IN THE winter '87 issue of *Radio Control Car Action*, I favorably reviewed the $\frac{1}{8}$ -scale Hobby Lobby* Hunter. I still own this car and have since received a number of letters from readers thanking me for directing them to it; I've yet to receive a negative letter. If someone puts out some hard-earned cash on an item and it turns out to be less than represented in a track report, you'll hear from that same person way before you ever hear from a satisfied one. Dave Martin of Hobby Lobby and I had a number of conversations about this potential stable mate of the Hunter. Hobby Lobby has a policy of checking



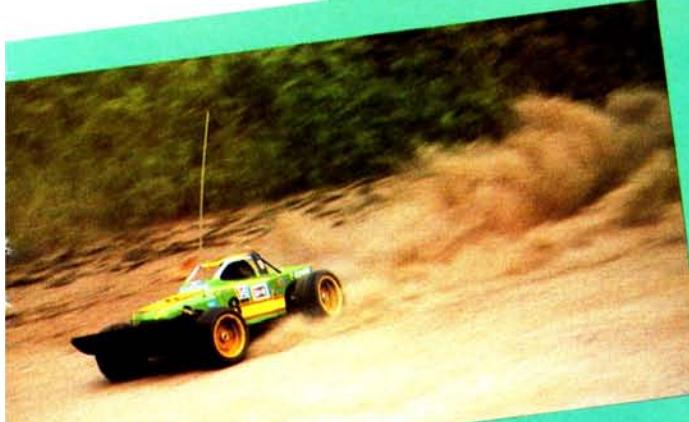
something out before they take it on. If there appears to be a potential for trouble, they'd rather not be bothered. Well, the Hunter now has a stable mate, the Tornado.

THE KIT. The Tornado is bred from the same school as the Hunter, that being the attention to structural quality throughout. The majority of the car is constructed from aluminum, steel, and composites such as glass-filled nylon upper and lower wishbones, and front and rear differential cases. The pre-filled, adjustable shocks are machined from aluminum and brass like the Hunter. However, the Tornado resembles the Hunter in design concept only. These are two different cars and from what I've seen, very few parts are interchangeable.

Since the Tornado lacks a metal cage, it has a Lexan body instead, which adds strength to the overall car. The Tornado differs from the Hunter in that it has a $\frac{3}{16}$ -inch chassis plate instead of the fiberglass chassis on the Hunter. If for some reason the



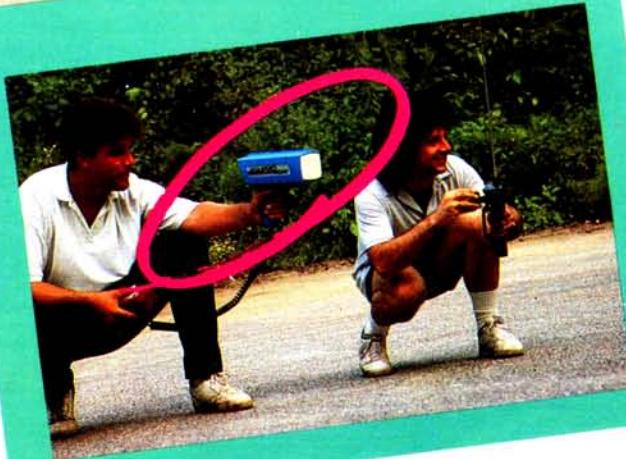
photos by LOUIS V. D'FRANCESCO, JR.



world ran out of wrecking balls, and some crazed individual (like myself) said, "Hey, let's use $\frac{1}{8}$ -scale cars instead," the Tornado would be a prime candidate. That's not to say it's a lead sled, it's not; it's merely the proper selection of materials for the job intended.

Other amenities the Tornado shares with the Hunter are ball bearings throughout, sealed radio box, quick-fill tank, and kit-included muffler and air cleaner. The dual disc brake and front sway bar (not found on the Hunter) are already installed. One of the most appealing things to me are the low-profile, wide-spike wheel/tire combos. Not only are these attractive, but along with the adjustable shocks and sway bar, this car can be set up to chew up a dirt oval track.

CONSTRUCTION. When it comes to construction,



Chris drives while Steve Pond clocks the Tornado with the RCCA radar gun.

the Tornado's lineage is traceable directly to the Hunter, there's just not that much to do. But there are a few things I'd like to point out so you can be aware of them before you begin.

(Continued on page 116)



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Hopped Up Rockbuster pictured.

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HOPPED-UP ROCKBUSTER - Basic design of above Rockbuster but comes with a RS-540 motor, new suspension, bigger tires and hubs. Designed for competition.

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SPACECASE



From Matrix Enterprises

by T.J. LYN

THE SPACECASE car case kit from Matrix Enterprises* is a unique concept in field transport boxes. The Spacecase lets you build a case to fit your R/C needs, not the needs of the general public. You may need to store more radios and cars than tools, or more tools than cars and radios. But whatever the case, you can build the ultimate field box.

My choice was the Spacecase 2000. This is the double-car case kit. It has ample room for 2 radios, 2 cars, a charger, and all the batteries and tools you could possibly need. With overall dimensions of 12x27½x18 inches, the kit also includes: 2 one-piece-molded car trays, 2 one-piece-molded parts drawers, and 1 molded tool drawer. All components of the Spacecase are made of ABS plastic that's ½-inch thick and textured for that fine-finished look. The materials are pre-cut for quick, no-tools assembly, and the kit includes everything you need, even a bonding agent.

The ABS plastic provides acceptable weight when the case is fully loaded and also gives the added advantage of being moisture- and fuel-proof, should an afternoon shower catch you by surprise, or should you decide to use the Spacecase for your gas car. Other key components are made from polycarbonate, for extra durability and flexibility. The hinges, carrying handle, and three-way corners are all polycarbonate. This provides the Spacecase with extra durability for any condition, including shipping to your final destination with the set of optional metal locking latches.

The Spacecase conforms to you, so you don't have to conform to space restrictions. Matrix Enterprises can provide you with the case of tomorrow with either the standard single case, double case, or a custom-designed unit.

*The following is the address of the company mentioned:

Matrix Enterprises, 7015 Carroll Rd., Dept. 01, San Diego, CA 92121.

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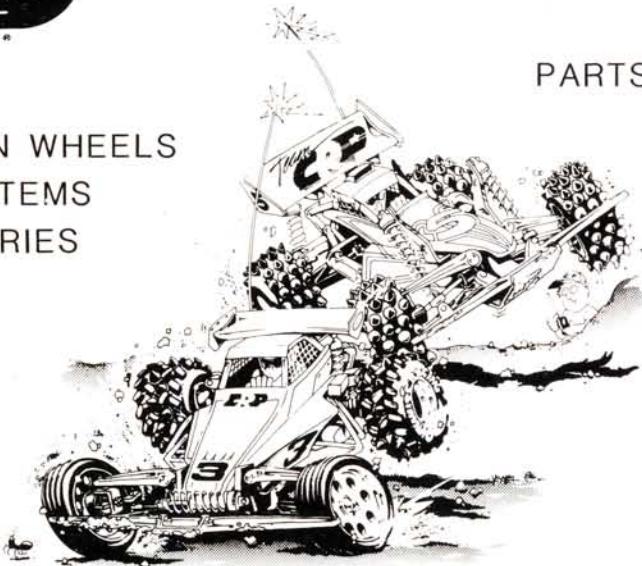
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TEAM KYOSHO

(Continued from page 18)

wheel-drive class.

Kelsey says "Racing and winning have legitimized our name. Kyosho will be a team to reckon with for quite some time."

With the two-wheel-drive World Championship already under the Kyosho Ultima banner, and with a new prototype Optima being tested and improved through competition, the rest of the manufacturers had better keep their eyes open. As Kelsey says, "Kyosho is in racing to stay."

**The following are the addresses of the companies mentioned in this article:*

*Kyosho: Great Planes Model Distribution Co., P.O. Box 4021, Champaign, IL 61820
Trinity, 1901 E. Linden Ave, No. 20, Linden, NJ 07036.*

TROUBLESHOOTING

(Continued from page 30)

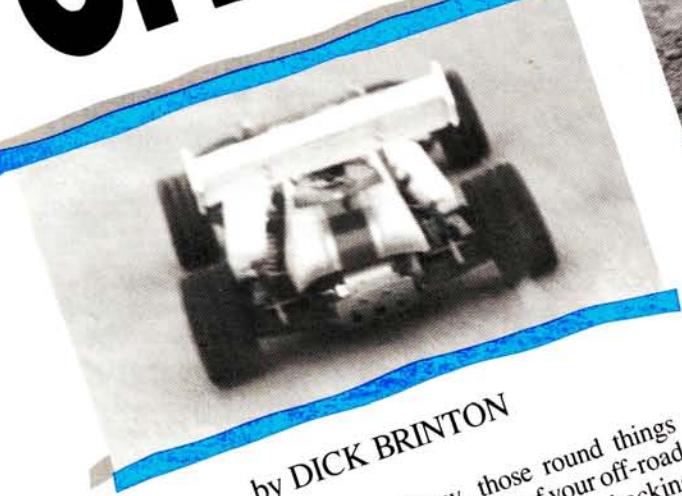
Parma's* rear shocks for the Grasshopper/Hornet (part No. 12610). These are very flexible shocks because of their adjustable coil-over spring setup.

You now have yourself a Hornet with a Grasshopper body. This can be easily remedied by replacing the Grasshopper body with one of the many

(Continued on page 62)

Find out what works best for your
track, car, and driving style.

OFF-ROAD TIRE GUIDE



by DICK BRINTON

TIRES. You know, those round things you stick on the wheels of your off-road racer to keep the rims from whacking the ground. If you're like I was when I began racing $\frac{1}{10}$ -scale off-road cars, your selection is based on what kind is being used by the drivers that are beating you.

If I wasn't going fast enough, I just checked the ones on my car, and stuck the same ones on my car. Some times it worked, but usually not well enough to beat the guy I was trying to copy.

Finally, I started doing the same thing full-scale race teams do, I tested tires to see what worked best for my car and style of driving; that's when I started winning!

What I've done in this article is to take a series of tires from four major manufacturers and, after testing, group them according to the results. In the charts that accom-

pany this article you'll find the tires listed by manufacturer and by best use according to track conditions. In addition, I've included the tread design ID number and the weight of each tire.

Tread design is the most important factor in the selection of tires. We're looking for the tire that gives the best traction for accelerating, braking, and cornering. Imagine finding the perfect tire, the one that wouldn't slip at all. The only limit to speed in the corners would be the point where the car rolled over on its top. Of course, there is no perfect tire. Each is designed to work under certain conditions and there's no tire that works well under all conditions. As your track conditions change, you must change tires to stay competitive!

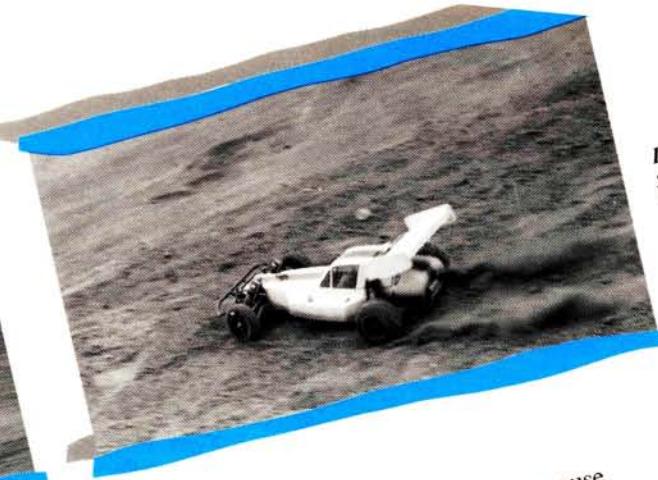
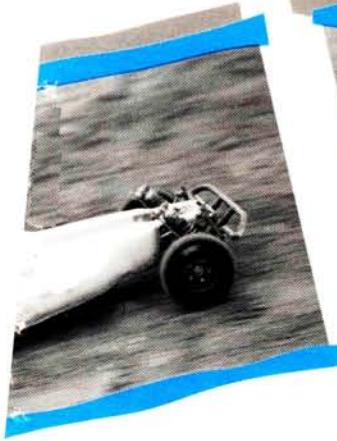
For instance, paddle-tread tires work very well in sand, while block-treads tend to spin. On hard-packed clay, paddle-treads offer poor results while block-tread tires provide a lot more traction.

Weight is also important. The more a tire weighs the more energy it takes to accelerate or decelerate.

BoLink cut-sponge
left, 3052 front and 331
at right.



Left to right: CRP 4216, Troll
60-71, BoLink 3050, MRP 4029.



Left to right: BoLink 3314/3052 give good full power hook-up on clean hard track. CRP 4214s working in the soft stuff with MRP 4028s up front. MRP's 4083 rears and CRP's 4216 fronts worked well together. Troll 60-01s bite together even with a loose differential.

Picture two types of tires: a 28-inch diameter truck tire free to spin on an axle, and a 28-inch bicycle tire. It's a lot harder to get the truck tire spinning fast than it is to get the bike tire moving. If you grab the bike tire you can stop it quickly. Firmly grabbing the spinning truck tire could give you the ride of your life.

In addition, tire/wheel weight (mass) is important since your car's suspension will work better with light wheels. Your damper/spring units have to do less work, because it's easier to control a lighter weight (smaller mass) than a heavy one. That's one of the reasons there are no 150-pound linemen in the National Football League.

The contact patch (the area of the tire that actually touches the ground) is not as significant as other factors. It's a lot more important to have a tire with the correct tread, flexibility, and compound. For instance, 3-inch diameter, polished-steel wheels that are 4 inches wide provide a large contact patch, but can you imagine the wheel spin and the weight problems if you tried to use them on an off-road car? So, fatter tires are not always better tires, but they are usually heavier.

Some tires have softer or more flexible compounds (the material with which the tire is constructed) than others. This usually allows the tire to settle to a larger contact patch with the same weight car. Softer tires also tend to absorb road shock a bit better than hard-compound tires. The down side? Too much side-wall flex can hurt handling, and they probably won't wear as well as hard tires. But try



Left to right: Troll 60-22, CRP 4213.

the soft tires on your car because when they work, they really work. The fact is, the more you experiment with tires, the more races you'll win; getting the correct tires on your car is vital.

It sounds as if the best way to go is to get the right tread for the track conditions on the lightest tire. It would be nice if it were that easy.

Unfortunately, it isn't. Factors such as the way your car's suspension is set, the design, the way you drive, the configuration of the track, the change in the track surface at different places, the strength of your motor/gearing combination, etc., all enter into your selection.

Though I can't give you the exact tires to use, as a result of the tire tests I can give you some clues as to what works best where. Use the charts as a starting point and experiment. Please be sure your car is adjusted and working properly before you start. Good tires cannot cure handling problems caused by a broken or binding suspension for instance, or glitches caused by motor noise in your receiver.

The tire tests were run on an Associated* RC10 with a stock motor and 6-cell battery. I didn't attempt to check lap times, since I had so many tires to test and knew I couldn't be consistent over a long driving session. Consequently, I checked the acceleration on various surfaces and the cornering through different turns on different kinds of track surfaces.

Here are some general observations. On clean, hard-packed surfaces the BoLink* 3314/3052 combination (which happen to be the lightest tires) worked best, but wide and/or soft-spiked tires such as CRP* 4214, MRP* 4083, and Troll/United Model Products* 60-01 also did well. Ribbed front tires also worked well on this surface.



Left to right: BoLink 3311, MRP 4078, Troll 60-

TRACK—SURFACE TIRE GUIDE

		Clean Hard Pack		Raked and Groomed		Deep Sand	Hard Pack with Loose Dirt		Hard Pack with Loose Sand		Nothing works very well on any hard surface with dry sand over it.
		Damp	Dry	Damp	Dry		Damp	Dry	Damp	Dry	
Rear Tires	BoLink	3314	3314	3311	3311	3311	3311	3311	3314	3314	
				3841	3841		3841	3841		3841	
CRP		4214	4214	4214	4214	4214	4214	4214	4214	4214	
				4213	4213		4213	4213		4213	
				4224	4224		4224	4224		4224	
				4225	4225		4225	4225		4225	
MRP		4083	4083	4083	4083		4083	4083	4083	4083	
				4082	4082		4082	4082	4082	4082	
				4078	4078		4078	4078	4078	4078	
Troll (UMP)		60-01	60-01	60-01	60-01		60-01	60-01	60-01	60-01	
				60-11	60-11		60-11	60-11		60-11	
				60-21	60-21		60-21	60-21		60-21	
						60-22					
						60-12					
						60-02					
Front Tires	BoLink	3052	3052			3050					
		3811	3811	3811							
CRP		4217	4217	4217	4220	4220	4220	4220			
				4216	4216		4216	4216	4216	4216	
MRP		4027	4027	4027			4028	4028	4028	4028	
				4028	4028						
				4029	4029	4029	4029	4029	4029	4029	
Troll (IMP)		60-71	60-71	60-71	60-71	60-71	60-71	60-71	60-71	60-71	
				60-81	60-81	60-81	60-81	60-81	60-81	60-81	

Tire Weights (in ounces)				
Rear		Front		
BoLink	3311	1.3	3050	1.5
	3314	0.5	3052	0.4
	3323	1.2	3811	0.9
	3841	1.1		
CRP	4213	1.9	4216	1.0
	4214	1.4	4217	0.9
	4224	1.4	4220	1.0
	4225	1.2		
MRP	4082	1.9	4027	0.8
	4078	1.7	4028	1.0
	4083	1.6	4029	1.2
Troll (UMP)	60-21	1.1	60-71	0.8
	60-11	1.1	60-81	0.9
	60-01	1.0		
	60-22	1.7		
	60-12	1.6		
	60-02	1.6		

On a raked and groomed track or on hard-pack with loose dirt (dry or damp), all the spiked tires worked very well. There wasn't a bad one in the whole bunch.

In deep, dry sand the paddle tires (Troll 60-22, 60-12, 60-02) worked the best. These were the only paddle tires tested. They come in firm, medium, and soft compounds. The BoLink 3311 and CRP 4214/4213 also worked in the soft sand because they're wide and didn't sink during acceleration. If you don't have paddle tires for sand, use the widest spiked rears you can find. All the ribbed/spiked combination front tires worked well in the sand; the ribbing seemed to help straight-line stability.

On hard-pack sprinkled with damp sand, the softest spiked tires worked best, but nothing was outstanding.

On hard-pack covered with a coating of dry sand, nothing worked very well. The sand acts like 1,000 tiny ball bearings, and the car spent most of its time in the weeds.

I'm very glad to see the tire manufacturers providing tires in various compounds from hard to soft. Troll even produces colored tires (yellow and red) to match your paint job. For some reason, perhaps a slight difference in compound, the colored tires worked a bit better than the same tires in plain black.

Just a few years ago, selection was limited. Now, you'll be able to dial your car in much more accurately by experimenting with harder or softer tires. I found a lot of difference in the handling of my RC10 by using the same brand of tire and tread, but switching from hard to soft compounds.

See you at the track.

**The following are the addresses of the companies mentioned in this article:*

Associated Electrics, 3585 Cadillac Ave, Costa Mesa, CA 92626.

BoLink R/C Cars, Inc., 420 Hosea Rd, Lawrenceville, GA 30245.

Custom Racing Products, 3250 El Camino Real, Atascadero, CA 93422.

Model Racing Products, 18676 142nd Ave NE, Woodinville, WA 98072.

United Model Products, 301 Holbrook Dr, Wheeling, IL 60090.



'87 F F - R O A D N A T S

by RICH HEMSTREET

WHAT DO you get when you mix 500 off-road race cars with red Georgia clay, add water, and bake at 100°? The 1987 ROAR Off-Road National Championships. This race was held at PDQ Raceway in

Atlanta, Georgia, during a heatwave. Sanyo joined up with PDQ to sponsor the event.

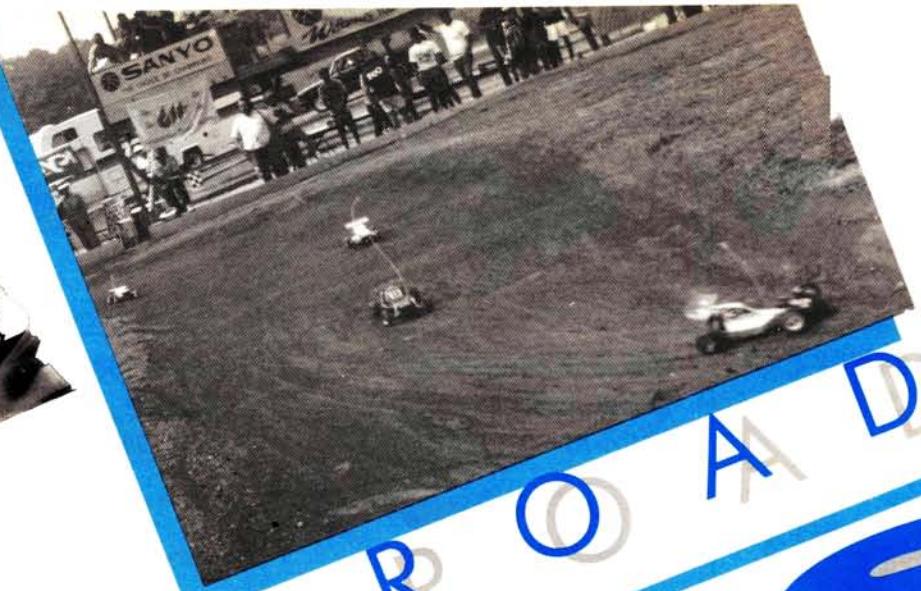
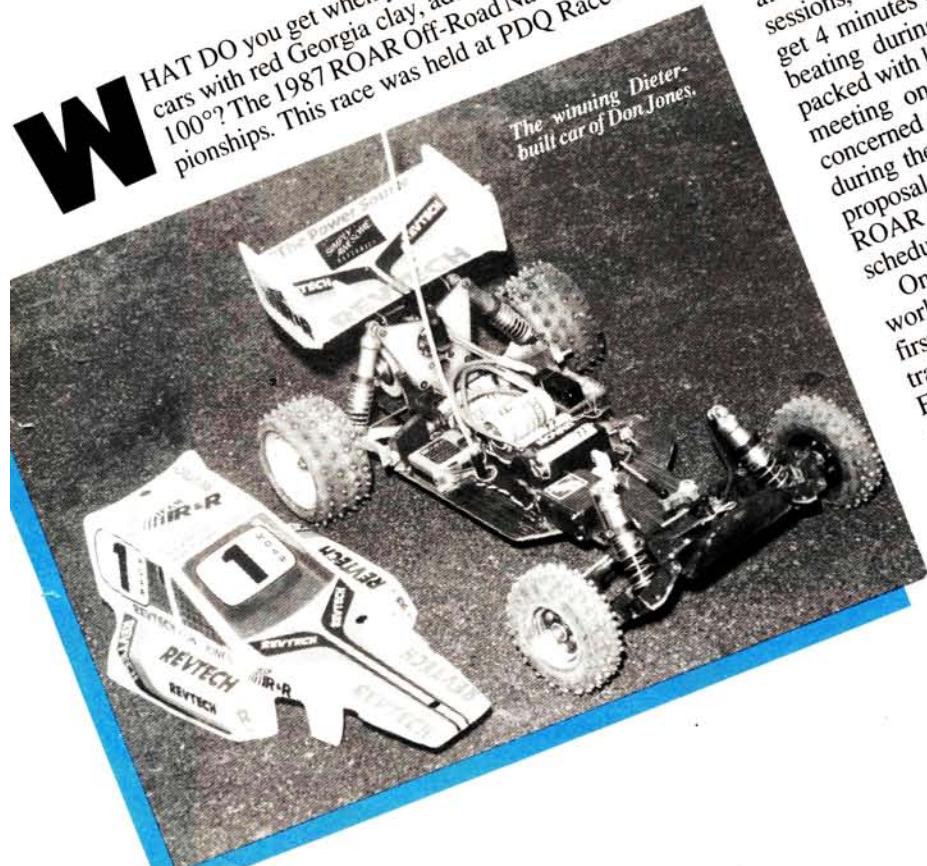
The 509 entries set a record for a ROAR event. Three champions were to be crowned for 1987: Stock Two-Wheel Drive, Open Two-Wheel Drive, and Open Four-Wheel Drive. During practice sessions, drivers stood on line for up to 45 minutes to get 4 minutes on the track. The track took a real beating during practice and became very hard-packed with little traction remaining. At the drivers' meeting on Thursday night, many racers were concerned about when the track would be watered during the racing. After arguing the merits of one proposal versus another for close to an hour, the ROAR officials decided to go with the pre-printed

schedule of races and track watering.

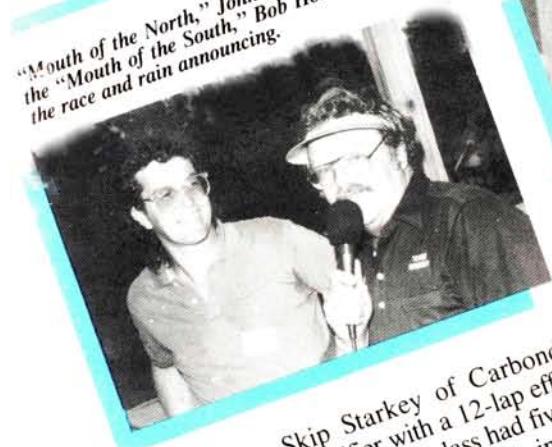
On Friday morning the PDQ track crew went to work early and got the track into great shape for the first round of qualifying. The clay produced great traction after it was groomed. The temperature on Friday was near 100° with high humidity. Many racers headed for their air-conditioned hotels between races. Late that afternoon a thunderstorm and high winds sent everyone running for cover.

Again on Saturday morning the track crew had to rebuild the track, this time because of the rain. But once again, the track was in excellent condition when they finished.

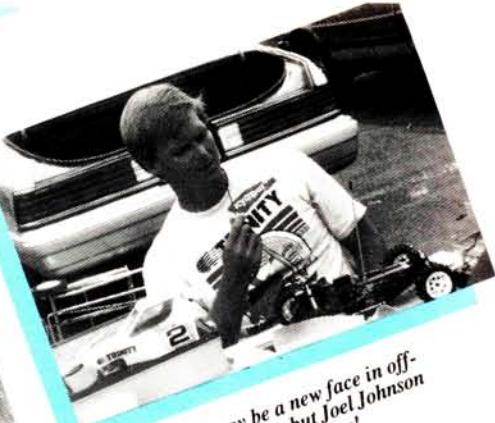
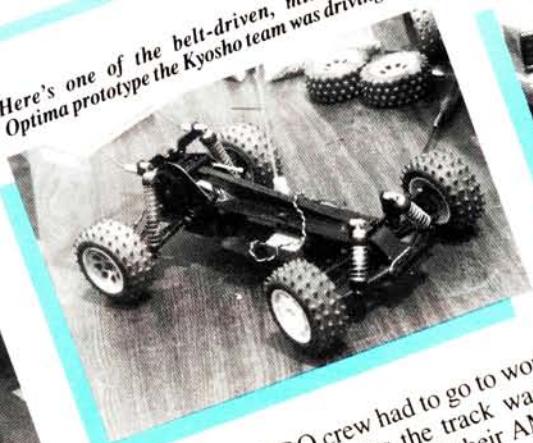
The Two-Wheel Drive Stock class was dominated by the Associated RC-10. Eight of the top ten qualifiers in the A main ran the RC-10. There was also an MIP, a scratch-built car, and one Hi-T



"Mouth of the North," John Thawley, left, and the "Mouth of the South," Bob Hosch, handled the race and rain announcing.



Here's one of the belt-driven, mid-engine Optima prototype the Kyosho team was driving.



He may be a new face in off-road racing, but Joel Johnson can drive anywhere!

graphite chassis. Skip Starkey of Carbondale, Illinois, was the top qualifier with a 12-lap effort. The Two-Wheel Drive Open class had five RC-10s, three Ultimas, and one Dieterbuilt in the A main. Joel Johnson's Ultima had a graphite pan and shock towers that might soon be marketed by Trinity. Joel was the second-fastest qualifier with a car he's had for only three weeks. Don Jones of Chicago, Illinois, was the top qualifier with a 13-lap run. His Dieterbuilt was a full lap ahead of Joel's time. Don's car was built by his teammate, James Dieter.

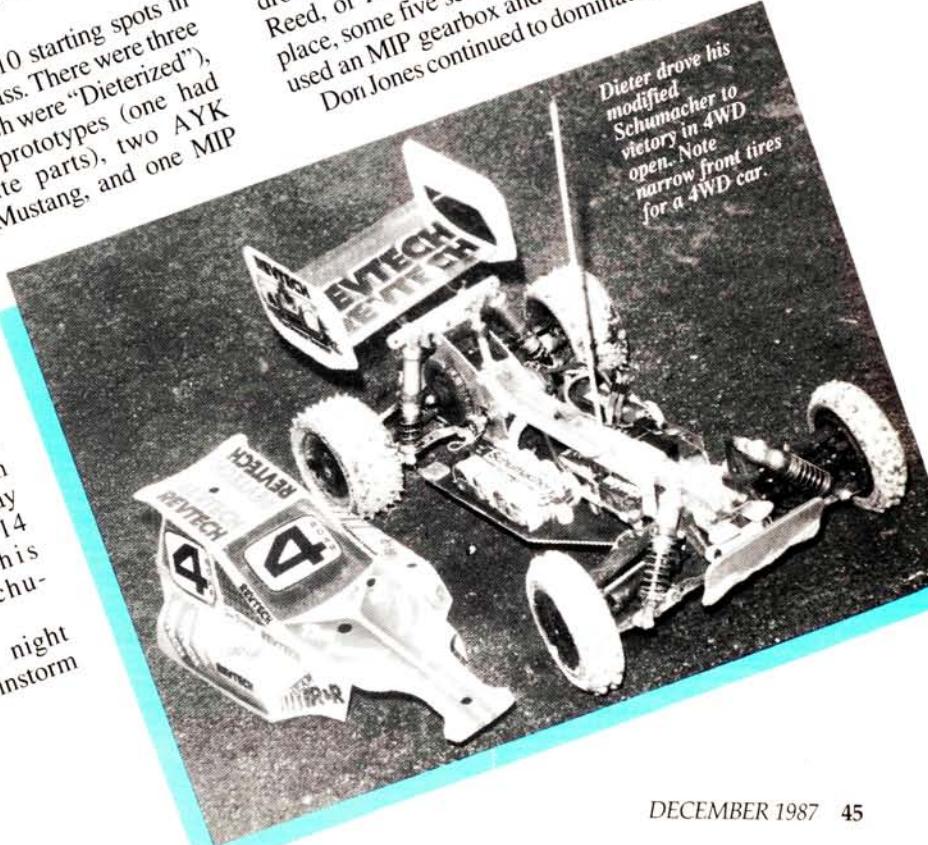
With 100° temperatures, this rainy race in Georgia was the south-east "shake and bake."

Five different cars filled the 10 starting spots in the Four-Wheel Drive Open class. There were three Schumacher Cats (two of which were "Dieterized"), three Optima belt-driven prototypes (one had Radiants, one P.B. Mini Mustang, and one MIP RC-10). Mike Giem, of Arleta, California, celebrated his birthday by being the top qualifier with a quick 13-lap run. Mike was less than 1½ seconds away from turning 14 laps with his "Dieter" Schumacher Cat. Saturday night another rainstorm

came. The PDQ crew had to go to work again. But early Sunday morning the track was in excellent shape. BoLink loaned PDQ their AMB Autocount system, which included a brand-new scoreboard and clock. This new unit lets the spectators know about the top three cars and the lap difference between them. It's a great addition for radio-control car racing. Rick and Linda Jordan of BoLink ran the scoring system throughout approximately 20,000 laps of racing with very few problems.

Jay Katz, of Garden Grove, California, drove to victory in the Two Wheel Drive Stock A main by

cutting some 8 seconds off his best qualifier. Jay drove a Hi-Tech car to the championship. Kyle Reed, of Riverside, California, finished in second place, some five seconds behind Jay. Kyle's RC-10 used an MIP gearbox and Composite Craft chassis. Don Jones continued to dominate the Two-Wheel



Dieter drove his modified Schumacher to open. Note narrow front tires for a 4WD car.



Drive Open class with a three-second victory over Kyle Reed. Don's Dieterbuilt was powered by a Revtech motor. Kyle's RC-10 used a Reedy motor. Mike Martin, of Valencia, California, finished third in his Trinity-powered Ultima.

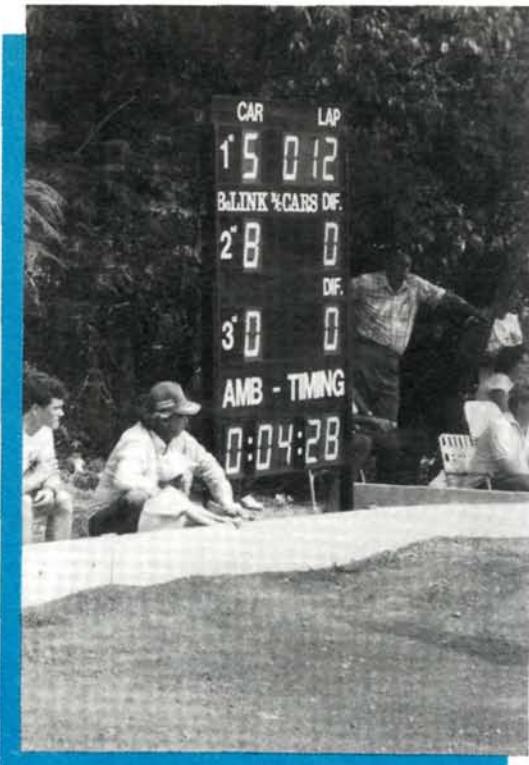
Midway through the Two Wheel Drive Open class, the rains came again. While the rain provided some relief from the intense heat, it looked as if the racing would be over for the day. But after an hour of rain, the clouds abated and the heat returned. After the track dried for an hour, the tireless PDQ track crew was back at work. They brought in dry dirt and totally rebuilt the track for the fourth time. During the rain delay, the racers and spectators were kept entertained by the "Mouth of the South," Bob Hosch, and the "Mouth of the North," John Thawley. Bob and John interviewed some racers and manufacturers, they also held drawings for donated merchandise and gifts. These guys did a great job announcing the races.

After the track crew was finished, the racing began again. Due to a threat of more rain, the Four Wheel Drive Open A main was moved up. James Dieter, of Joliet, Illinois, drove an excellent race to win the National Championship by 5 seconds over Joel Johnson. James was driving a "Dieterized" Schumacher Cat powered by a Revtech motor. Joel drove a Trinity-powered, belt-driven, Optima prototype. Andy Dobson of North Royalton, Ohio, finished third, driving a Parma-powered P.B. Mini Mustang.

It took 6½ hours to complete each round of racing. A racer running in only one class had to wait for over six hours for a four-minute race. Roar should institute some type of regional qualifying for participation in future national events.

Congratulations to the 1987 ROAR Off-Road Champions, Jay Katz, Don Jones, and James Dieter: they certainly earned their titles! ■

Above, first turn action in one of the 2WD Open heats. Right, the new AMB scoring tower worked great.



Class: Two-Wheel Open, Championship Main

Finish	Qualified	Driver	Chassis	Motor	Speed Control	Tires
1	1	Don Jones	"Dieterbuilt"	Revtech	Tekin	CRP/Schum.
2	9	Kyle Reed	RC10	Reedy	Victor	ProLine
3	3	Mike Martin	Ultima	Trinity	Novak	Kyosho
4	8	John Peterson	Ultima	Twister	Victor	ProLine
5	5	Robbie Blackmon	RC10	Lightspeed	Novak	Tam/ProLine
6	7	Scott Montgomery	RC10	Lightspeed	CMW	ProLine
7	6	Randy Dale	RC10	Lightspeed	CMW	ProLine
8	4	David Maruglio	RC10	Twister	Tekin	Kyosho
9	2	Joel Johnson	Ultima	Trinity	Tekin	Kyosho
10	10	Ken Peterson	Unknown			

Class: Four-Wheel Open, Championship Main

Finish	Qualified	Driver	Chassis	Motor	Speed Control	Tires
1	4	James Dieter	"Dieter" Schum.	Revtech	Tekin	Schumacher
2	6	Joel Johnson	Optima Prototype	Trinity	Tekin	Kyosho
3	5	Andy Dobson	Mini-Mustang	Parma	Laser	Schumacher
4	3	Eric Soderquist	Optima	Twister	Airtron.	Kyosho
5	10	Mike Martin	Schumacher	Trinity	Novak	Proline
6	9	Eustace Moore	MIP/RC10	Trinity	Tekin	Kyo/Schum.
7	8	Kris Moore	Optima Prototype	Twister	Novak	Kyosho
8	2	Steve Dunn	Radiant	Race Prep	Novak	ProLine
9	7	Mike Dunn	Radiant	Race Prep	Novak	ProLine
10	1	Mike Giem	"Dieter" Schum.	Revtech	Tekin	Schumacher

Class: Two-Wheel Stock, Championship Main

Finish	Qualified	Driver	Chassis	Motor	Speed Control	Tires
1	3	Jay Katz	Hi-Tech	Hi-Tech	AJ	
2	2	Kyle Reed	RC10	Victor	Kyosho	
3	8	Michael Ebert	RC10	Novak	Tam/Pro	
4	10	Tony O'Reilly	RC10	Novak	AJ/CRP	
5	4	Brandy Dreifus	MIP	Airtron.	ProLine	
6	1	Skip Starkey	RC10	Novak	Tam/Pro	
7	6	Todd Fox	RC10	Novak	Kyo/Pro	
8	5	Ken Groat	RC10	Novak	Kyosho	
9	7	Steve Majors	RC10	Victor	Kyosho	
10	9	Mike McAllister	RC10	Tekin	AJ/Pro	

Track Report

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MANX

from Varicom Industries

by T.J. LYN



SO, YOU'RE considering the purchase of your first off-road buggy. I'll bet that not long after you buy it you'll be going to the hobby shop for some hop-up equipment to give your buggy more show and go. Well, before you go through all the extra expense of putting aftermarket trick parts on your buggy, you might want to consider the Mugan Manx from Varicom Industries*.

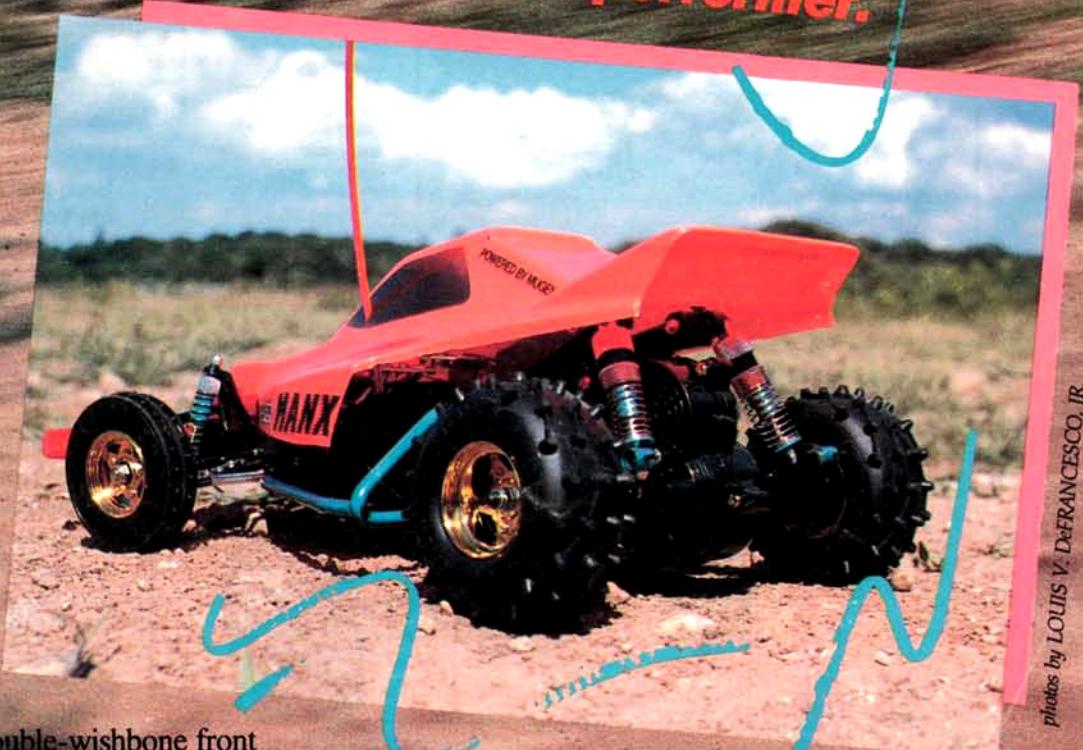
The Manx provides you with a time-proven sealed differential for reliable service, along with a one-piece bathtub-type chassis and a fully adjustable front A-arm suspension. Coupled with these durable features are the extra components that allow the Manx to be "tricked-out" right from the box. For those of you who have been following the "Project Series" in *Radio Control Car Action*, you'll find many performance aftermarket components are included in the Mugan Manx.

Standard equipment on the Manx includes a high-performance three-step speed



A tricked-out production-class performer.

control, the ever-reliable Mabuchi 540S motor, studded rear tires with studded and ribbed front tires, four coil-over, oil-dampened shocks, rear sway-bar kit, heavy-duty double-wishbone front suspension with adjustable camber, heavy-duty steering, custom gold-plated three-piece rims, and aluminum nerf



photos by LOUIS V. DEFARANCESCO, JR

MANX

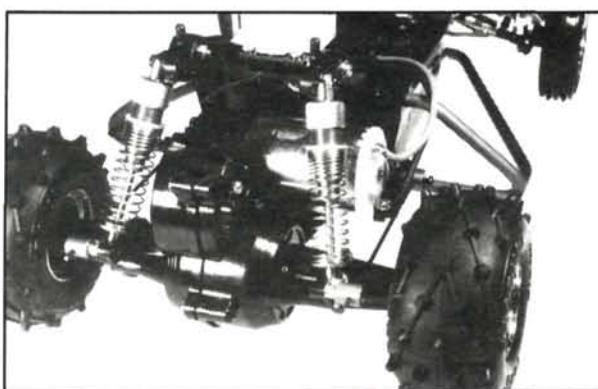


bars. All you have to add is a two-channel radio system and a 7.2-volt Ni-Cd battery and you have a "tricked-out" car that's fun for R/C enthusiasts of all ages.

THE KIT. The Manx kit is very easy to assemble with its step-by-step, pictorial manual.



The Manx sports heavy-duty steering and oil-filled dampeners as shown at left. Above right shows the Manx three-speed controller and radio compartment.



Rear-end view shows V-spiked tires, heavy-duty shocks, anti-sway bar and the reliable Mabuchi 540S.

Each step of assembly has clearly marked parts bags which allow for trouble-free parts identification. A word of caution: make sure you trim off all the flashing on the plastic/nylon components for a clean, even fit. Another place to be careful during assembly is the order in which the manufacturer recommends installing the front suspension and the steering servo. The manual states that you should assemble the suspension, then install the steering servo and steering linkage. I highly recommend that you reverse this procedure. Otherwise, you'll have to disassemble the front suspension when installing the steering servo and linkage.

After assembly is complete you'll have to make some minor adjustments to the front wheel alignment that the manual doesn't cover. The first

(Continued on page 108)

Futaba

TOP SECRET



photo by LOUIS V. DeFRANCESCO, JR.

FX 10

by T.J. LYN

ALL TERRAIN

IN ANOTHER one of *Radio Control Car Action*'s efforts to bring the R/C world with the latest developments, we at the mag bring you this exclusive preview of Futaba Corporation of America's* FX 10 All Terrain offroad car kit.

Futaba Corporation is among the first R/C buggy manufacturers, having introduced a 1/8-scale gas-powered offroad car over 10 years ago, and it is the world-renowned authority in radio equipment that brings you the FX 10 All Terrain car. The FX 10 was designed and developed by Futaba Corporation of America after painstaking consideration of all scales, in both 2WD and 4WD. A 2WD 1/10-scale offroad car looked to be the most versatile entry-level R/C kit possible. The FX 10, being an excellent first car, was designed to include full compatibility with established 1/10-scale rules regarding motor and power supply. Careful considerations were given to its ease of assembly, component interchangeability with leading brands in bearings, shocks, and tires, the design of the monocoque tub chassis for protecting valuable mechanical components, and the 4-link independent rear suspension for the all-terrain performance the R/C enthusiast seeks.

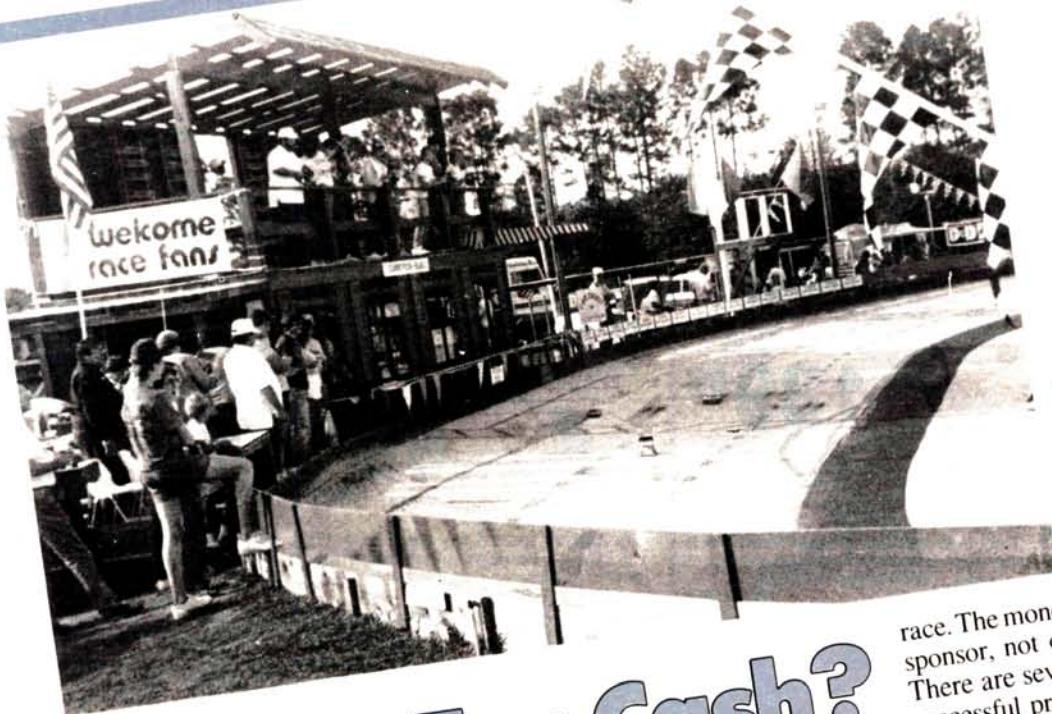
With the help of Futaba's international team of

racing experts, the FX 10 has incorporated many of the features of the serious competition models, and is as much fun to build as it is to drive. As the young or novice enthusiast, you'll learn about modern race car design as you construct the FX 10 around Grand Prix styling, with independent suspension, planetary gear differential, and coil-spring dampers on all four corners. All this is designed for the easiest assembly and lowest maintenance possible. Assembly requires only standard screwdrivers, pliers, tweezers, and a hobby knife. Special socket and Allen wrenches, gearcase/bearing grease and electrical contact lubricant are all included with the kit.

The FX 10 powerplant is a big 540/05-class motor, the largest size approved for organized national and international competition. The racing influence is also evident in the FX 10's 4-link independent rear suspension and the lightweight polycarbonate body shell. The FX 10's all-terrain design will mean racing performance on all surfaces from dirt and sand to grass and pavement. Off-road racing suspension geometry and weight distribution also let the FX 10 handle surfaces that aren't flat: whether it be jumps or berms found on rough tracks, the FX 10 will take them all on. The FX 10 also features a full-width

(Continued on page 104)

The Pole Position



If professional racing develops, it will probably revolve around first-class, permanent race facilities such as Lake Whipporwill.

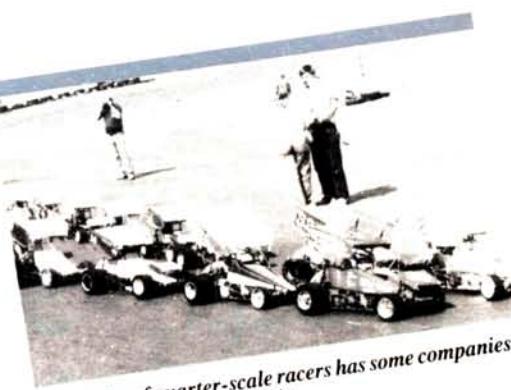
Racing For Cash?

by RICH HEMSTREET

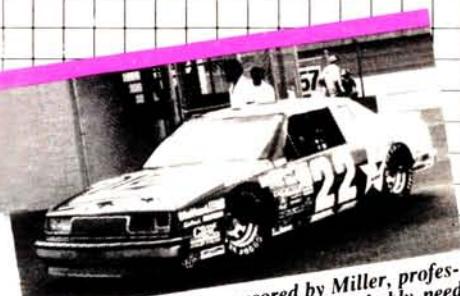
PROFESSIONAL RACING. There's been a lot of talk about professional racing this past year, but not everyone is talking about the same thing when they say professional racing; some are simply referring to racing for money. Others are looking at the creation of a big league professional racing circuit. Most of the racing-for-money descriptions I've heard are nothing more than gambling. They go something like this: 20 racers pay \$20 each to enter a "money race." The \$400 taken in is divided \$250 to the winner, \$100 to second place, and \$50 to third. This is all at the expense of the other 17 drivers; it's not much different than playing poker. For years, ROAR has officially opposed racing for money. And I totally agree with them; we don't need gambling in radio-control car racing. Professional racing is quite different. Here, a promoter or organization finds a sponsor to provide financial backing for a

race. The money paid out comes from the sponsor, not out of the losers' pockets. There are several things necessary for a successful professional circuit. First, the organization running the races must have strict technical rules that are enforced equitably. Second, there has to be sufficient exposure to keep the sponsors happy. Without their help, there won't be any prize money. Finally, the money has to be divided in such a way that the entire field earns something. You won't have 30 racers paying out money to attend the race if only the top 3 finishers share the money. While the last place finisher may not cover all of his expenses, he needs to be able to cover a portion of them. That's the situation in NASCAR Winston Cup racing; all the qualifying teams earn some money, at least more than their entry fee.

I'm not sure if anyone will be able to make a living from a professional radio-control car circuit; there will be some income potential, but it's expensive to travel the circuit and remain competitive. Of course, each racer can go out and find his own sponsor. That's the way Bill Elliott and others make a living. They're not dependent on their on-track success for a weekly income; the paycheck is part of the sponsor package. This is the idea



The size of quarter-scale racers has some companies concerned about libel suits.



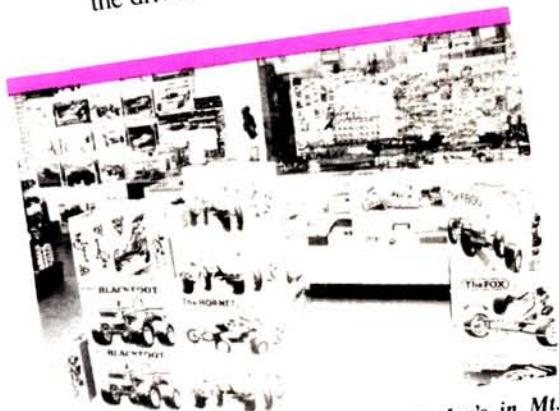
As Bobby Allison is sponsored by Miller, professional radio-control drivers will probably need sponsors to cover their costs.

sitation for a professional racer, whether in full-scale or radio-control racing.

Some racers I've talked with are afraid professional racing will hurt the sport. I don't agree—not if the group running the race has strict rules that are very similar to ROAR rules on car construction. Exotic, \$5000-dollar radio-control cars aren't necessary; we need to keep the cost of competition down.

Presently, several top drivers are basically professionals. Their companies (sponsors) take care of them at the major races around the world. Many of these drivers are ready for a professional circuit, and it isn't fair that rank amateurs should have to race against these drivers for national championships.

I doubt that a professional racing circuit would actually give the amateurs a shot at winning any major events. But I think that all major events should have an invitation or expert class for factory-sponsored drivers, and a separate class for amateur racers. The only problem with this is trying to determine which drivers belong in which class. Some type of rating system may have to be developed to place the drivers in their proper classes.



Well-stocked hobby shops, such as Ar-Jay's in Mt. Clemens, MI, will be plenty busy as the holidays approach.

Turkey Races

As the holiday season approaches, here's an idea for local clubs to use at their races. A week or so before the holiday have a Turkey Race. No, that doesn't mean you'll have to raise a bunch of gobblers and let them loose on the track! However, you'll have to buy enough frozen turkeys so that the winner of each main can take one home.

My club did this last year and it really put the pressure on to win your main. I hooked up in a real battle with Ted McCarthy. At the end of the race we were both shaking from nerves. Sometimes a turkey is more fun to race for than a trophy; try a Turkey Race for a change.

Safety

This past year I've been to quite a few races around the country. At some of them I saw flagrant violations of safety rules. At one national event, a driver got in trouble for not having on closed-toe shoes, while I saw several other drivers wearing open-toe sandals. There was even a race official walking around barefoot! As with all other rules, let's apply them equitably to all participants. I'm sure the insurance people would appreciate it if all the safety rules were followed.

I know some manufacturers are very concerned about their products being used for $\frac{1}{4}$ -scale racing. They feel that the possible liability problems are greater than they'd like to risk. I think that $\frac{1}{4}$ -scale cars will be able to race safely on permanent track sites; however, most temporary sites probably lack the necessary safety features. Thirty-pound, $\frac{1}{4}$ -scale cars that are running 40 mph require extremely solid outer barriers to protect racers and spectators. The race organizers must be sure to strictly enforce the safety rules, especially slowing or stopping the racing action before retrieving any stopped cars on the track.

At almost every race I attended, racers were using illegal radio frequencies. They were either using airplane-only frequencies, or some "special" frequency they had found that worked. Most drivers use illegal frequencies to get more track time. They don't have to wait for a frequency clip. If the clips are being monitored, these drivers just take any available clip, making someone that's using a legal frequency wait for them. I know many race directors appreciate the lack of radio conflicts when setting up heats and mains, but let's have everybody play within the same rules and not allow unfair advantages.

Race directors are also opening themselves up for expensive lawsuits when they allow illegal frequencies to be used. I wouldn't want to take a chance on a lawsuit just to avoid a bit of hassle at the track.

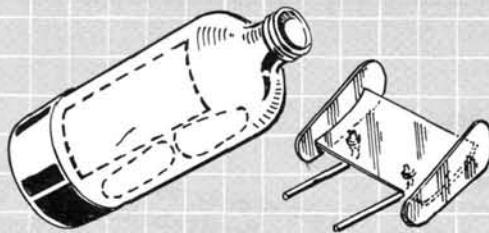
Remember, in January of 1988, you can no longer use 72 Mhz for R/C cars (or boats). If your radio equipment is on 72.160, 72.320, or 72.960, take it to a radio technician and have it retuned to a legal frequency. Don't use your radio in '88 until it's legal.

Let's follow the rules and beat the competition fairly next year.

Rich Hemstreet, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

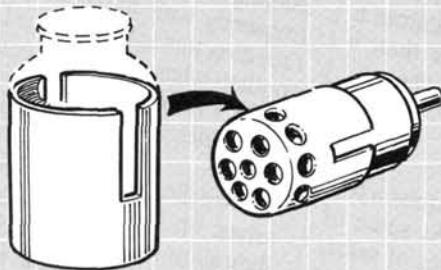
Pit Tips

by JIM NEWMAN



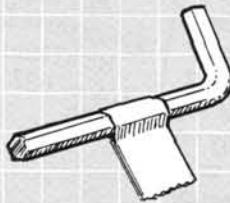
Two-liter soft-drink bottles are useful material for wings. Cut components as shown and the wing will be ready curved. I don't know what adhesive was used on polycarbonate plastic, but hot-melt glue will work nicely. Reader says wing can be painted or left clear—which would be unusual.

Donnie Glover, Dothan, Alabama



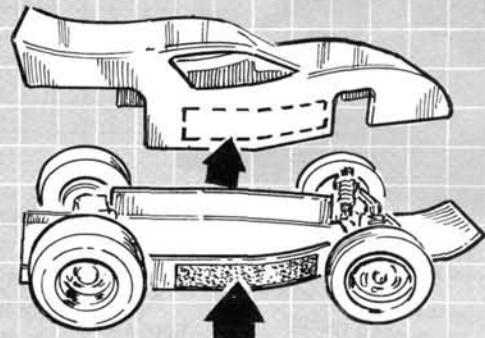
Ever had the wires break off your Hornet's motor during rough racing? Cut the top off a Tylenol plastic bottle, then force it over the end of the motor to provide a protective cover for the wires, etc. Brushes and commutator really need all the cooling air they can get, so I recommend drilling large holes in the bottle for adequate air flow. You might also use Doug Lesan's sock idea, too.

Mike Martin, Wrangell, Alaska



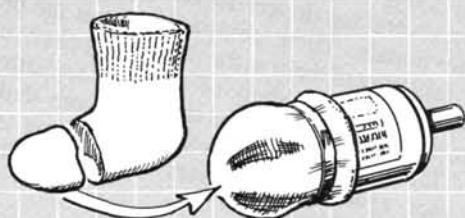
In the heat of fast pit work, dropped Allen wrenches can be difficult to spot on the ground. Wrap a brightly colored adhesive tape "flag" around the shaft of the key as shown. You could also paint the keys—see "Pit Tips" on page 38 of the October '87 issue.

Brian Kirby, Fayetteville, Pennsylvania



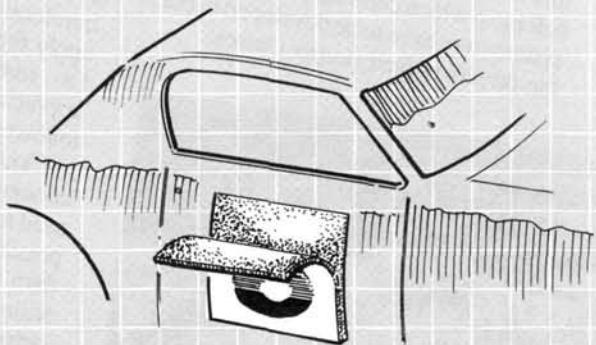
Instead of using the body clips to attach his bodywork, this owner glued Velcro along each side of the chassis and the matching part inside the body skirts. This makes for a very secure and resilient mounting.

Jason Sommerset, Portland Oregon



If you can keep the filth out of your motor, the brushes, commutator, and bearings will thank you with a longer life. Cut the toe from a baby's cotton sock, then slip it over the bell end of the motor, securing it with a rubber band or cable tie. Sock acts as a useful air filter. To prevent fraying, run a little cyanoacrylate glue around the cut edge.

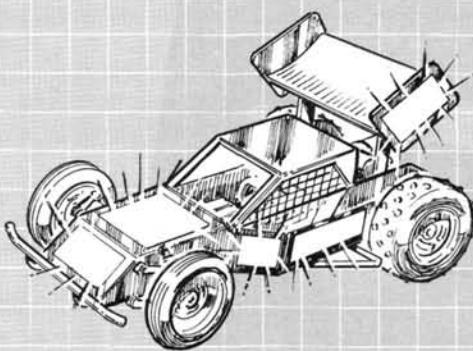
Doug Lesan, St. Joseph, Missouri



Here is a neat idea for quick-change race numbers. Glue Velcro on each side of your car, then cut thin plastic or card squares on which you place your numbers. Glue Velcro on the back of each square.

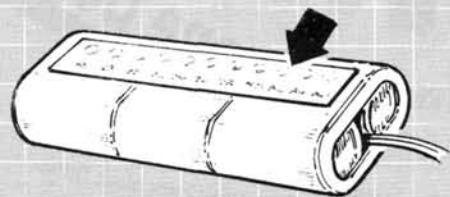
Rick Poon, Huntington Beach, California

Radio Control Car Action will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send rough sketch to Jim Newman, c/o **Radio Control Car Action**, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



Racing under poor light conditions, this driver had some difficulty in picking out his car. His answer was to cut patches of fluorescent paper and attach them to his vehicle—the brighter the color the better. Some office supply stores sell fluorescent labels in round and square shapes.

Eric Troutman, Mt. Pleasant Mills, Pennsylvania



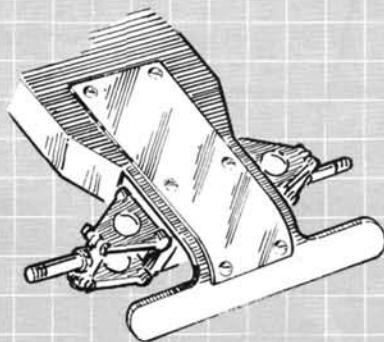
This is an easy way of monitoring your battery's temperature. Tape a liquid crystal aquarium thermometer to the top of your battery pack. These are readily available from pet stores for about \$3.

Andy Newell, Glenmont, New York



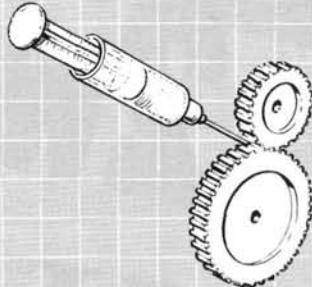
A source of high-pressure air is a very useful thing to have at your pit counter. It's great for blowing dirt out of your car. Empty Freon containers can be purchased inexpensively from your local air conditioning man. Conversion kits of a gauge, hose, stop cock, relief valve, etc., can be purchased at your auto parts stores and, when converted, the portable air bottle can be charged at the local service station if you do not own a compressor.

Fred Tonte, Easton, Pennsylvania



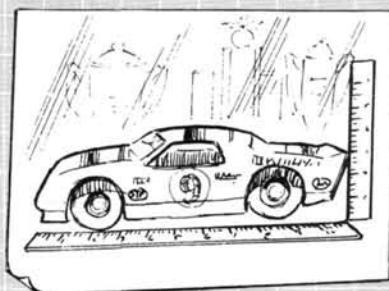
Our contributor suffered a spate of broken front bumpers on this Tamiya Falcon. His answer was to cut a piece of aluminum 3x6 inches and attach it to the bottom of the chassis with self-tapping sheet-metal screws. This reinforces the weak area ahead of the suspension and also doubles as a skid plate.

Nick Daily, Crestwood, Kentucky



Getting a little irritated with the high cost of molybdenum grease from the usual sources, this car owner shopped around and found that auto stores sold large containers for about \$4. He then invested in a syringe from the drug store and found this a very convenient way of accurately dispensing the grease.

Dean Kwasnica, Winnipeg, Manitoba, Canada



Our reader points out that when selling your car, a picture can be worth a thousand words—or \$100! He recommends taking a snap shot with a couple of rulers placed as shown to give the reader of the ad some idea of the size of the car. Why not also pose the car with all the trophies it has won, too?

Ross Culp, Mooresville, North Carolina



2WD vs. 4WD

by RICH HEMSTREET

HOW DOES a two-wheel-drive off-road car compare to a four-wheel-drive car? That's the question I'll address. To get valid results, I found two cars that were very similar. Obviously, a full-blown, race-ready, two-wheel-drive car could run away from a ready-to-run, "toy-like," four-wheel-drive car. And the latest belt-driven, graphite-chassied four-wheel drive could stomp all over a Grasshopper.

I chose the MRC/Tamiya* two-wheel-drive Fox and the four-wheel-drive Boomerang. Not only are these cars very

close in price, but their suspension systems are nearly identical. Both cars have fully-independent suspensions with a mono-shock, coil-over front dampener. The Fox is rear-engined, while the shaft-driven Boomerang is mid-engined.

The Fox comes with ball bearings everywhere except the front wheels. The Boomerang has nylon and metal bushings as standard equipment. I felt the test would be more fair with bearings throughout, so I installed a set of Aerotrend* ball bearings in the four-wheel drive. The Boomerang took a total of 22 ball bearings and 2 ball thrust bearings in its 2 gearboxes. These bearings made for an extremely smooth drive train.



In a tug of war, the Boomerang threw dirt at the Fox.

I installed a Futaba* R2H micro receiver with an S-32 steering servo in each car. To keep performance equal, I replaced the standard speed controls with a pair of CMW* CM-10 electronic speed controllers. These units provide instant throttle response with good power. I used the standard RS-540S motors in both cars (after breaking them in for several hours).

While the Boomerang has 2 gearboxes, it wasn't really any more difficult to build than the Fox. The four-wheel-drive car only weighs about an ounce more than the two-wheel drive. Both cars used identical rear tires. The Fox has ribbed tires up front, while the Boomerang has a narrower version of the rear tires up front.

With a pair of fresh 7.2-volt Tamiya racing packs charged up, it was time to hit the track.

The first test was an acceleration run. The Boomerang shot off the line, all four tires throwing rooster tails. The Fox couldn't keep up with the Boomerang at the starting line. Next, I tried the cars' jumping abilities. The Fox seemed to have better balance going over the jumps. Both cars were very stable upon landing, but the four-wheel drive was quicker, regaining traction after the jumps.

The Boomerang was extremely fast through the corners; there was never a need to back off the power to get through a turn. With the four-wheel-drive advantage, the Boomerang could pass the Fox on the inside of any tight turn. While the Fox handles very well, it takes more attention and concentration to go really fast. I could keep the throttle flat-out on the Boomerang through the turns, but the Fox's throttle needed to be feathered or shut off completely to achieve a good line through the sharper corners.

The four-wheel-drive car was very easy to control in power slides around the sweepers; the Fox took a lot more steering input to get around them quickly. The brakes on the CM-10 speed control were very helpful on the Fox, but I didn't have to use them on the Boomerang.

The Fox had more top-end than the Boomerang; I'm sure the drag of the second gearbox slows the Boomerang down to some degree. But top speed isn't as important as getting through the turns on most off-road tracks. And for getting through the turns, four-wheel drive is hard to beat.

Considering the ease of fast driving in the dirt, a four-wheel-drive car is the way to go. It would be much easier for a beginning racer to drive a Boomerang than a Fox, but there's one final area to consider: reliability.

In most local off-road events, the four-wheel-drive heats which begin with 8 cars usually have only 3 to 4 cars left at the finish. Four-wheel-drive cars are more complex and tend to break down much more frequently than their two-wheel-drive brethren.

During the photo session, the Boomerang sustained a broken bumper, a bent front dog bone, and the steering locked up. But even with the bent dog bone, the Boomerang was quicker than the Fox. The Fox didn't have any mechanical problems throughout the testing. This is

the main reason why it's best for beginners to start in the two-wheel-drive class; they'll gain more experience if their car runs the entire race without breaking. But when you're ready to break the track record, four-wheel-drive is the way to go!



The Fox exhibiting excellent jumping ability.



The 4WD was great at taking the inside line through the turns.



2WD and 4WD taking a jump together. Notice the difference in landing attitude.

*The following are the addresses of the manufacturers mentioned in this article:
Model Rectifier Corp., 2500 Woodbridge Ave, Edison, NJ 08817.
Aerotrend, 31 Nichols St, Ansonia, CT 06401.

Futaba Corporation of America, 555 W. Victoria St, Compton, CA 90220.
CMW International, 2101 Midway Rd, Suite 250, Carrollton, TX 75006.

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TROUBLESHOOTING

(Continued from page 38)

aftermarket bodies available from companies like Parma and McCallister*, just to mention a couple. If you're going to change the body, I'd highly recommend getting a Parma Universal Mounting Kit for the Grasshopper/Hornet (part No. 10450). This kit helps to make the mounting of any body a snap.

Now, a few more modifications that won't break the bank and should enhance the performance of your Grasshopper a lot.

The front suspension and steering can be improved quite easily by adding a heavy-duty tie rod set from Parma (part No. 12601). The other option in the shock area is a complete front shock kit from CRP*. The Parma shocks are direct replacement units and bolt right onto the existing shock towers for a quick addition. The CRP shock kit provides you with a complete aluminum shock tower system that replaces the existing towers, or can be a great fix (if you have broken the original shock towers). The CRP kit comes with a set of coil-over shocks that are adjustable (just like the Parma units), and all the mounting hardware you'll

(Continued on page 70)

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